STABILANT 22

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APPLICATION NOTE

Use of Stabilant 22 in Educational Computing & A/V Equipment

- *What is Stabilant 22?*

Stabilant 22 is an *initially non-conductive* block polymer that under the effect of an electrical field and/or when used in a very narrow gap between metal contacts, becomes *conductive*. The electric field gradient at which this occurs is set so that the material will remain *non-conductive* between adjacent contacts in a multiple pin environment.

Thus, when applied to electromechanical contacts, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contact surfaces together.

While **Stabilant 22** exhibits surfactant action it is *not* sold as a contact cleaner. Equally, it exhibits quite good lubricating properties but is *not* sold as a contact lubricant. Its metier is in its *active properties* when used in a connection and the other properties are a bonus.

- *Where can it be used?*

Stabilant 22 can be used wherever electrical contacts are used, whether this is in connectors, or in switches. For example, one common use is to improve the connection reliability of socketed IC's in computers.

- *What is the effect of Stabilant 22 in computers used in education?*

The effect of **Stabilant 22** in Computers is to increase long-term reliability and reduce repair costs. This is done by reducing the number of times the system locks-up or crashes due to contact malfunction, the single greatest cause of computer malfunctions. Often, it even eliminates non-software crashes completely.

There are a very large number of contacts in each computer. Some are used in switches, such as the keyboard's key switches themselves. Others are used in the socketed integrated circuits, and in the card-edge connectors used on plug-in boards. Yet others are used to connect the computer to its keyboard and peripheral equipment such as printers, scanners, etc. Often it takes just a single failure of one of these contacts to cause a computer to crash.

In educational applications, it's no secret that the computers receive very hard usage, usage that sometimes slips over into near-abusive levels. Quite often, a computer will be down because of an intermittent problem caused by a connector, a problem that may not re-occur on demand when the technician is attempting to service the unit. No one should be surprised at the fact that these problems are often almost impos-

sible to locate even though it may be hard for the teaching personnel to understand why it is so difficult for the technicians to solve this type of problem on a permanent basis.

Let's review the conditions within a contact that cause this type of problem. If we were to examine the connecting surfaces of a contact under a microscope, we would find that the metal, which looks quite smooth to the naked eye, seems as rough as a mountain range. The actual contact is made by a number of points scattered over the total area of the contact. In between these points is open space. The volume is small, we grant you, but it does provide a path for the entry of airborne contaminants such as oils, waxes, chemicals, and even cigarette smoke and tars. While many contacts are gold plated to prevent corrosion, this does not prevent the entry of airborne contaminants. The situation is even worse for many contacts (such as some cheaper RS-232c printer connectors) that do not use gold plating.

Depending upon the type of connector, contaminant entry may cause several possible effects:

1] The contaminant may swell, forcing the contact points apart,
2] The contaminant may spread over the contacting points leaving a thin film having odd conductive properties,
3] The contaminant may cause corrosion of the contacts. This can cause some very strange effects as many metal oxides and sulfides exhibit semi-conductive effects that may result in turning the contact into a rectifier. While this might not bother the signal by itself, it would make the contact very susceptible to any RF signal that might be picked up. Thus, a radio signal could cause a signal artifact within the computer that could cause it to crash, or could result in corruption of stored data.

Sometimes the apparent solution seems as simple as unplugging and replugging the connector, although this may prove to offer only a temporary relief. In the case of RF susceptibility, the problem may only exist when the computer is in a specific physical location. Where FM broadcast or TV broadcast signals are the source of interference, moving the computer or its cables even a few feet may make the problem go away. To complicate matters, some broadcasting stations change their antenna-radiation patterns at different times of the day which may alter the RF fields near the computer. Thus a computer that might fail in the classroom might function perfectly in the test facility. But the potential for failure is still there.

There are other environmental hazards as well. No one would expect soft drinks or coffee to find their way into keyboard contacts, yet it does happen.

Contacts (and by inference, electro-mechanical switches) are generally the least reliable part of any system. As the number of contacts increases, and as the power level of the signals handled by these contacts decreases, the potential for system malfunction increases very rapidly. The shift to ICs requiring very low operating currents has cut the power requirements of microcomputers tremendously, but it has also made them much more susceptible to both RF interference (sometimes called Electronic Smog), and even the slightest amount of contaminant penetration.

Stabilant 22, and the isopropyl alcohol diluted version designated **Stabilant 22a** offer the only *active* means of ensuring contact reliability. Unlike cleaners, the material is applied and *left in place!* It this is what is technically termed an *active-resi-*

dent treatment. Use it once throughout a computer and the probability of crashes due to contact problems are virtually eliminated. This translates into very large savings in maintenance not to mention an improvement in the availability of computer resources to the instructional program itself!

- *Why should we use Stabilant over less expensive alternatives?*

  Granted that the material itself is expensive. However it is unique in having a very long useful life once in place. Unlike other so-called contact treatments **Stabilant 22** will not cross-link (becoming varnish-like) under the action of sulphur based curing agents in elastomers, cutting oil residues, or the sulphur-bearing free-machining metal alloys used in some contacts. *In most types of service work, the cost of the time involved in removing and replacing a board will be several times greater than the cost of the Stabilant used to treat the board.* What is important here is that not only will a total treatment with **Stabilant 22** cure existing contact problems, it will prevent others from occurring, thus eliminating the necessity of repetitive-types of repair work, such as numerous contact-cleanings, at a later date!

  In other words, why pay the extra costs of having to do the same job several additional times?

- *What are the effect of Stabilants when used in computer peripherals?*

  It is just the same as when used in computers. Printers usually work without trouble for the first few months. But there comes a time when it seems as if they are possessed. This is especially true of units which are operated from the parallel interface (the so-called Centronics standard) as this type is much more susceptible to connector malfunction. Treatment with **Stabilant 22** can prevent these problems.

  Stabilant can bring reliability to LANs as well. Whether the LAN uses unshielded wire and telephone type connectors, or co-axial cable and BNC connectors, **Stabilant 22** applied to the connectors and to the card-edge connector used on the LAN board can ensure years of trouble-free operation.

  When used on socketed IC's, photo-couplers/isolators, rotary, push button, or slide switches, the net effect is usually to make the operation of the equipment less erratic, and in the case of IEEE-488 buss-controlled equipment, to cut down on the potential for system lock-ups.

- *Can the Stabilants be used on Audio-Visual equipment?*

  Most A/V installations do not have nearly so many contacts as computer systems and therefore the effects of using **Stabilants** are not quite so dramatic. Nevertheless, there are many places where the **Stabilants** can stop annoying malfunctions, increase reliability, cut down on signal distortion, improve signal-to-noise ratios, and save maintenance costs in these installations. We have been told of several cases where language labs that were almost unusable because of age-related problems. There was excessive noise and distortion in the audio channels, switching was not reliable, and even the headphone connectors were intermittent. The cost of equipment replacement was well beyond the school's budget and maintenance costs were increasing rapidly. After all the connections were treated with the **Stabilants** (many connections could be treated with the dilute form - **Stabilant 22a** - without disconnection of the wiring) the labs functioned smoothly and reliably once again! Maintenance costs also dropped to a much more manageable level.

- *In what packaging sizes is Stabilant available?*

  Stabilant 22 is packaged in 15mL, 50mL, 100mL, 250mL, 500mL and 1 Liter containers. **Stabilant** is 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 allows the end-user to add his own diluant and saves the added costs of shipping isopropyl alcohol, as well as allowing the end-user to use an alternate diluant such as one of the other solvents used in electronics.

- *What is the difference in the use of the Stabilants?*

  The concentrate, **Stabilant 22** is most useful where the connections are out in the open such as the card-type connections. 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 diluant 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 it did not ease the application of the material and simply wasted many times the amount that actually got on the contact areas. It generally left a film of excess material that had to be cleaned up if only for appearances sake.

  A further consideration is the fact that although chlorofluorocarbon propellants are no longer generally used in spray cans, often a highly inflammable mixture of Butane and Propane is substituted. Remember, very little **Stabilant 22** is necessary to treat a contact, so why waste it?

- *Is Stabilant just another contact cleaner?*

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

- *Just 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 who wanted a standard kit that they could issue to their service personnel. It consists of a 15mL container of

Stabilant 22A and some soft-tip swabs as applicators, all in a small capped tube. The applicators are reusable.

- *Why would anyone want to buy a half-liter of the concentrate?*

  Many manufacturers make large volume purchases, diluting the material for specific applicators used on their production lines.

  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 that run any risk of being without the material. The number of uses tends to increase as users discover the large number of problems that can be solved by the material. One user routinely applies it to the flashlight switches and batteries it issues to its security guards and has reported that the number of requests for replacement units has dropped appreciably.

- *How can I be sure that the material works?*

  We could cite the fact that **Stabilant 22** is used by many hospitals on their bio-medical electronics to improve reliability of the equipment where lives are at in the balance, we could cite the use of **Stabilant 22** by many broadcasting networks to achieve the last measure of reliability in critical network switching applications, we could cite the fact that it has been TSO'd for use in air-navigational aids & instrument landing systems, or we could cite the years of use in the audio field where even consumers found the material easy to use and its results impressive; but we still feel that the best way to find out just how well it works is to try it out! That's why we have samples available. Almost every service shop or manufacturer has equipment on hand where the switches or connectors have become erratic over the years. Use **Stabilant 22A** on them for a quick-turnaround test, or use the material in field service on known defective connectors and satisfy yourself.

- *Is the material hazardous?*

  Stabilant 22 has caused no skin reactions in tests. In the undiluted for it is, non-flammable, although if its temperature is raised above 200° C the decomposition products will burn. If orally ingested in small quantities it will cause bowel looseness although ingestion of quantities in the order of 200 ml could cause systemic collapse! **Stabilant 22** has an LD_{50} of about 5 grams per kilogram body weight.

  In the United States, neither **Stabilant 22** or **Stabilant 22a** are subject to the Toxic Substance Control Act (TSCA) and neither are reportable under SARA chapter III. In those states having restrictions on the amount of solvent used in coatings, the fact that the use of even **Stabilant 22a** results in a reduction in the equipment solvent burden/year by about a factor of 200 has led them to be the contact treatment of choice for environmentally conscious agencies.

- *Will the Stabilants cause damage to the equipment?*

  No. The materials have been extensively tested for compatibility with circuit-board materials, conformal coatings, as well as with the various plastics and elastomers encountered in electronics. That's not to say that there is no chance that somewhere, someone may be able to devise a cheap plastic material that might show susceptibility to degradation from the **Stabilants**, but because of all the solvent-compatibility requirements that are in place in the industry, it is doubtful if this would ever be used in any commercial-quality electronic equipment.

- *Can it be used by untrained personnel?*

  The consumer version of **Stabilant 22** which is sold as TWEEK™ has been used for several years now without problems.

- *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. Camel's hair or sable brushes can be used to brush it on card-edge connectors. Cards can also have their edge connectors dipped into the dilute material.

- *Does the action of Stabilant 22/22a deteriorate with age?*

  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, or when used on contacts where cross-link promoting agents are present in the environment. This phenomena of "varnishing" does not occur with **Stabilant 22**.

  Stabilants have been in some applications for over twelve 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 loss by evaporation. Stabilants are non-reactive with other materials and unlike contact-greases (which are composed of a volatile oil combined with a soap-like material) there is nothing to evaporate or harden. The surfactant action together with the lubrication properties when combined with the electrically-active nature of the material to ensure that treated connectors will often continue to function properly even though the equipment itself may be so old as to be technically obsolete!

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. Worldwide 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