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APPLICATION NOTE

Problems with Silicone Films on Electromechanical Contacts

- *Why do silicone films cause intermittencies in contacts?*

While the water-repellent characteristic of silicones make them potentially beneficial for use on connector assemblies exposed to excessive moisture, there are other characteristics which, under certain circumstances, can cause problems. Silicone films can, when the proper conditions exist, combine with metal ions to form restive films such as sodium silicate. As some potentially reactive silicones can be polymerized by metals such as lead or sodium, the potential for the formation of very thin, high resistance films can exist.

- *Where does this problem exist?*

The most obvious location is where silicone dielectric greases are used to waterproof connectors, but it can also exist where silicone mold-releases were employed in the manufacture of either molded-rubber or molded-plastic parts used in the connector assembly. While the service departments of some companies are aware of the potential problem, some well-meaning customers may cause the problem by employing cleaning-sprays that contain silicones. Several of these were very popular as TV-tuner cleaners and are still available from electronic parts houses.

There are also a number of pieces of equipment which use silicone oils as part of their design. The most notable of these are encountered in the copier industry where silicone-bearing oils are often used in the ink-fusion section of the equipment in order to ensure that the fusion rollers will not stick to the melted ink particles. As the surface energy of the melted ink is often quite low, there is a need for a very low surface-energy on the heated roller in contact with the paper. Under these circumstances it is not unusual to encounter contact problems in the vicinity of the ink fusion section. In addition, the cooling airflow may carry the volatile silicone to other connectors downstream of the fusion unit. There is even a potential problem for connectors near the paper path that follows the fuser. Although the amount of oil that is actually carried by the paper itself is probably negligible, there is usually some small amount of airflow caused by the motion of the paper and it may well be this that carries the silicones to the paper-exit areas of the equipment.

Because the deposition of silicones on the contacts in copiers takes place over a long period of time, there is a greater potential for those films to react to other atmospheric contaminants than would occur in the case of contacts where a silicone oil was used as a moisture barrier.

This phenomenon can be divided into two classes, those where the material acting to catalyze the silicone is found in the contact itself, and those where the catalytic

material is external to the contact. In the former case, the metal connector pins, especially when platings such as solder-alloys, will be the source of the catalyst; while in the latter, atmospheric metal ions such as the salt-laden air found in coastal areas can initiate the problem.

- **Can these problems be prevented?**

Yes, most cases can be prevented. The ideal solution is the elimination of the silicones from the connector and/or the equipment. For obvious reasons the latter may not be possible. In some cases it may be feasible to enclose a wiring-harness-mounted connector-pair in a long-sleeve of plastic tubing in order to minimize the exposure of the connector to the silicone-bearing airflow. While this might not prevent the problem from occurring in the long-term it might delay the time when a critical film thickness was reached. It may also be possible to re-position the connector, or even to alter the airflow so that the connector lies in a stream of clean air.

The ideal situation is where the problem can be anticipated in the equipment design stage.

- **What can Stabilants do to stop these problems?**

If the **Stabilant** can be applied during manufacture of the equipment, the material will act as a barrier to deposition of the silicone.

Where the condition already exists, liberal application of the isopropyl alcohol diluted Stabilant 22a can usually purge the collector of most of the silicones, albeit at the cost of wasting Stabilant. But if the silicone has already reacted to form, say, a film of sodium silicate it may be necessary to use abrasion to remove the film. Where doubt as to the actual state of the silicone contamination exists, it is probably worth while to replace the connector and have the surface of the contact analyzed in a laboratory equipped for micro-analysis. In such cases, the laboratory may well be able to advise the service department as to the most efficient and/or most environmentally acceptable solvent to use in the removal of the contaminant film.

In any event, the **Stabilants** could prevent the problem from recurring.

NATO Supplier Code 38948 - 15 mL S22a size 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

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