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Considerations for reducing computer failure

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Uninterruptible power supplies (UPS's) have evolved as very thorough power conditioning devices to maintain power to computers and electronic equipment. There are also several other conditioning devices on the market, each conditioning power in different ways: transient suppression devices, regulators, isolation transformers, generators (isolation and sustaining), voltage synthesizers, LC filters, RC filters, dedicated lines and special grounding.

Regardless of the type of power conditioning device in use, however, there are some very effective maintenance methods that can be used to combat basic equipment stresses and to prevent computer problems.

Eliminate heat

In any given electronic controller there is a mix of integrated circuits, transistors, diodes and other components, all of which have varying heat tolerances. Therefore, the cabinet temperature must be controlled to satisfy the components with *lowest* temperature failure limits. A marked increase in operating stability and a decrease in maintenance downtime can be achieved if ambient temperature inside control cabinets is held between 75 to 100°F. When electronic cabinets exceed 110°F malfunctions start to occur. 115 to 120° starts to bring about hardware failures. Additional air-conditioning or destratifying fans will cure these problems. Inexpensive thermometers, with magnetic mount base and peak holding needle, can be mounted in electronic cabinets to detect cabinets with temperature problems. Care should be taken not to over-rate Btu capacity of air-conditioners and not to mount so cold air blows directly on circuit boards.

Eliminate dirt buildup

Many electronic control cabinets, even recent models, are insufficiently sealed against contamination. This weakness can be detected by a rapid buildup of oily dirt or black dust on circuit boards. Contamination can enter through wire ducts, vent panels, around switches and around door edges if improperly sealed. Contamination buildup will cause resistive paths, shorting between wires and board traces, intermittent disruptive failures and finally, permanent hardware failures.

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Often times (even among name brand manufactures) cooling is achieved by circulating shop air through the cabinet. This practice may get you through the new equipment warranty period, but is not adequate in many environments for long-term reliability. Dirt packs around and over components preventing them from getting rid of heat. Dirt also contributes to corrosion problems. After sealing cabinets it may be necessary to add circulating fans or an air-conditioner to keep temperatures below 100°F. Foam rubber strips with adhesive backing are readily available for sealing around doors and panel edges. Duct sealant or any nonflammable flexible material should be used to seal around cable holes and knockout holes in the bottom or top of the cabinets.

Eliminate vibration, oxidation

Electronic controllers and computers suffer when subjected to excessive physical vibration. The results are three-fold:

1. Circuit boards gradually vibrate out of their sockets, resulting in intermittent or lost connections, which can cause machine crashes, jumping or runaways.

2. Continued vibration can actually shear component and lead connections.

3. Vibration causes slight movement on all friction connections, such as circuit board socket connections and plug socket connections. This slight

movement can cause the friction connection to move from an area of low resistance (good connection) to an area of oxidized high resistance (bad connection).

Number 1 and 2 above can be solved by placing shock mount pads under the control cabinet or by using rubber center vibration isolating bolt mounts. This writer has seen several instances in the field where both of these problems were occurring on brake presses, shears and numerical control machines. The maintenance personnel had grown accustomed to repetitive failures and accepted them as 'normal maintenance'. However, when proper shock mounting was installed, the electronic maintenance dropped to zero.

Number 3 above may exist when No. 1 and 2 are not noticeable. It may result from slight vibration, but can also result from simple aging of friction connectors. This can be cured by using the proper deoxidizing agent on friction connectors. Again, several field case instances have been observed where oxidation buildup on older controls had become so troublesome that a control retrofit was being considered. With the proper application of a contact cleaning solution and deoxidation treatment, however, complete reliability was restored to the controls. Normally, application of any solution to circuit board connectors or plug pins is prohibited or discouraged for the following reasons:

1. Some solutions may clean the contact, but cause faster oxidation in the future.

2. Other solutions may prevent further oxidation buildup, but will not remove existing oxidation and will leave a thin film, which will attract dirt and iron-dust buildup.

3. The common use of an eraser to remove dirt and oxidation from pins and circuit board edge pins is discouraged, as the friction of the eraser will rapidly wear through thin layers of gold or silver plating, thus ruining the conductive surface.

There is, however, one solution which has been proven effective in field application to remove oxidation and prevent future oxidation buildup and which does not wear away or corrode material. If used according to the manufacturer's recommendation, it should not leave a film to attract dirt. This solution is Cramolin Red from Caig Laboratories Inc., Escondido, CA. Cramolin should be used rather than an eraser when reseating, replacing and cleaning circuit board edge connectors, cable connectors, jumper pin contacts, etc.