

Title: STARTER CONTACT REPLACEMENT

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Models Affected: ALL ELECTRIC DRIVE CENTRIFUGAL CHILLERS

PURPOSE

This bulletin provides information to assist service personnel in determining when it is necessary to replace starter contacts.

BACKGROUND

There have been occasions when starter contacts were removed from starters during the warranty period and returned to the starter manufacturer as "burned" when the contacts were actually in excellent condition.

RECOMMENDATION

It is recommended that the attached Cutler Hammer Publication No. 14183 be used as a guide to determine if a starter contact is in need of replacement.

It is very unlikely that contacts would need to be replaced during the first year of operation. The fact that the contacts are black or pitted is not cause for concern. The only criteria for replacement is excessive loss of contact material or curling of the contact material caused by improper welding of the contact to the contact carrier.

One situation where contact replacement during the first year might be expected is if there is a short circuit caused by miswiring or motor failure.

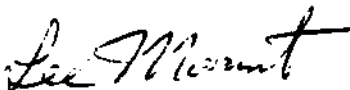
CAUTION:

Contacts should never be inspected or replaced without first disconnecting the power at the motor branch circuit disconnecting device. In starters provided with a separate low voltage supply, the separate control source should also be disconnected.

FILE KEY: Controls/Wiring

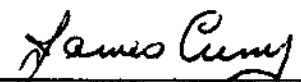
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Prepared By: _____



Lee Mount

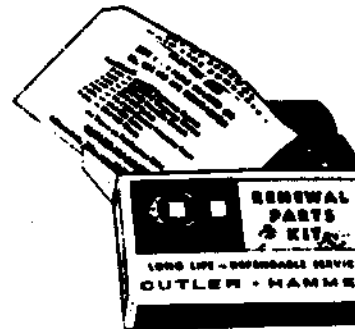
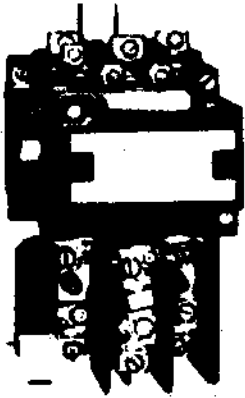
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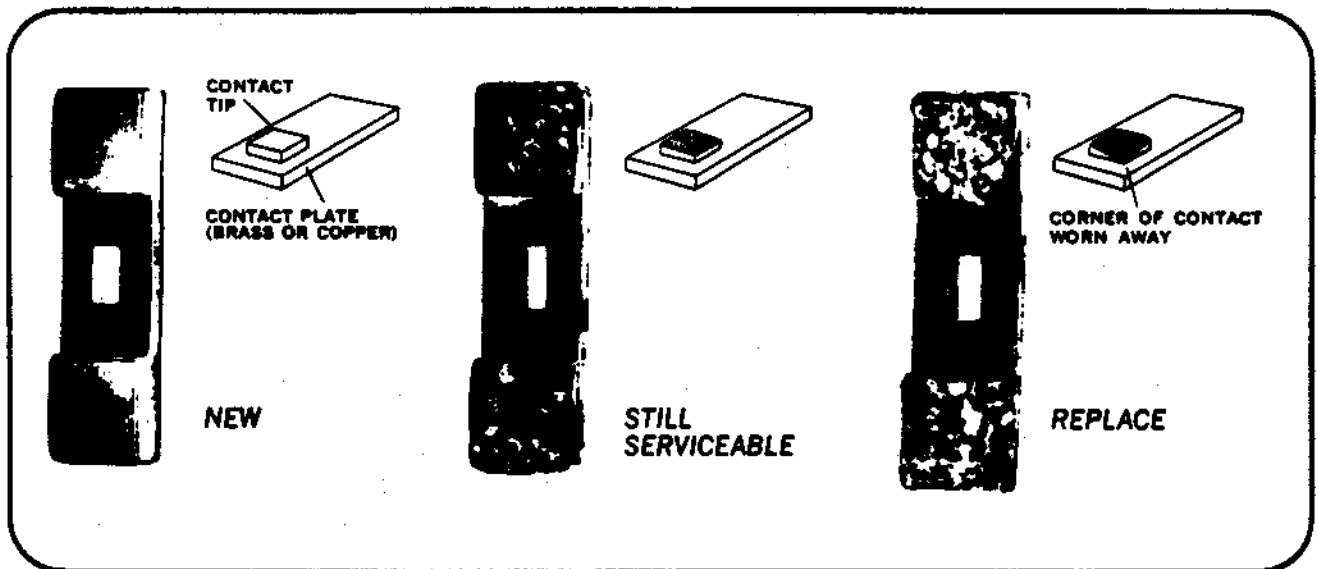
James Cuny

TO ELECTRICAL MAINTENANCE MEN

ARE YOU GETTING FULL SERVICE FROM THE CONTACTS IN YOUR CUTLER-HAMMER CONTROLS



Here's a hint that may be HELPFUL...



Are you throwing away contacts before they are worn out? Have you wondered when contacts do need replacing? Are you making the decision to replace contacts based on your experience with old forged copper contacts?

Cutler-Hammer's introduction of the cadmium silver oxide contacts, over a decade ago, heralded a new era of longer contact life. But with longer contact life came new visual contact inspection means of judging when contacts need replacement.

This brochure is designed to help you get maximum life from your contacts, yet replace them before a costly shutdown occurs.

WHAT CAUSES A CONTACT TO WEAR OUT

In establishing and interrupting motor currents, contacts are subjected to both electrical and mechanical wear. Normally mechanical wear is insignificant. Electrical wear, caused by arcing, erodes the contacts; and during arcing a small part of each contact is vaporized and blown away.

Accurate determination of the time to replace contacts should actually combine measurement of wear allowance and judgment regarding the appearance of the contacts.

VISUAL INSPECTION

CAUTION: Contacts should never be inspected without first disconnecting the power at the branch circuit disconnecting device. In starters provided with a separate low voltage power supply, the separate control source should also be disconnected.

As contacts continually make and interrupt a current, the surface of the contact will change in color, contour, in smoothness, resulting in discolorations, irregularity of surface, and pitting. Normally a new contact has a uniform silver color. As electrical wear occurs, the silver color may change to blue, brown, or black. The black color is primarily a result of silver oxidation which is beneficial to contact operation. The presence of small black embedded granules in the contacts indicates the presence of cadmium oxide which is also an excellent electrical conductor.

Irregularity of contour is caused by uneven electrical wear. Such wear does not necessarily indicate that a contact is worn out. Considerable silver is built into the contact to provide for wear allowance.

Irregularity of contour usually involves a slantwise type of wear. As an example, one corner of a contact may wear more quickly than the other three corners wear away. This type of wear is normal. Even though the wear allowance of the contact may not be exceeded, contacts should be replaced if it is noted that one contact is nearing the condition in which it will be making direct contact with the plate. The plate is the material on which the contact tips are fastened. If the plate material is contacted, welding of the contacts may occur.

Pitting is caused by melting and vaporization of the material. The pitted surface has high spots and low spots, and tests indicate that such a surface provides a better contact than a smooth surface. The size of a pit mark, or crater, is proportional to the amperes of the arcing current. On a high amperage contact, then, the pit marks will be larger than on a low amperage contact. Pitting of a contact that is wearing well will show a uniform texture. When it appears that chunks are being torn away from the arcing surface, it is advisable to replace the contact.

Curling of a contact is a condition in which the corners of the contact separate from the plate to which the contact is fastened. If such separation is occurring, the contact should be replaced. Curling is usually a result of service that produces very high heat. An example of such service is severe inching or jogging of the contactor, or when the device is subjected to fault conditions that occur from short circuits or grounds in the system. If the condition continues to exist with each replacement of contacts, the application should be carefully checked to determine if the contactor is properly rated for the application, and whether other associated equipment is operating properly.

Inspection of contacts is a simple maintenance operation. Merely remove the contact block cover and slide out the movable contact bar. Where periodic maintenance is performed regularly, inspection of the movable contacts alone will tell the story. If the movable contacts are in reasonably good condition, chances are that the stationary contacts are also

in good condition. If the contacts appear to be questionable, check the stationary contacts also, and the wear allowance as described in the next paragraphs. With a little experience, you will soon become an expert in judging contacts by their appearance and **YOU WILL AVOID THE NEEDLESS WASTE OF THROWING AWAY GOOD USABLE CONTACTS.**

MEASUREMENT OF WEAR ALLOWANCE

Wear allowance of a contact is defined as the total thickness of contact material which may be worn away before the contact becomes inadequate to carry the rated current. Generally, a contact is serviceable as long as the remaining wear allowance is not less than a specified minimum value. Usually this minimum value is in the order of 0.015 inch.

On a contactor, the means of determining how much wear allowance an arrangement of contacts has remaining is to insert a 1/32" feeler gage between the armature and the magnet frame, and move the armature toward the sealed position until it comes to rest against the feeler gage. At this point, if the contacts are touching, the wear allowance has not been exceeded, and the contacts are still usable.

In many instances, visual observation of the contacts during measurement of wear allowance, may be difficult. A more reliable method of determining whether the contacts are or are not touching is to use a continuity checker. There should be continuity with the armature closed against the 1/32" feeler gage. It is advisable to use a wide feeler gage to avoid the possibility of tilting the armature while holding it closed.

If the continuity checker indicates continuity, the contacts have sufficient wear allowance to still be usable. If there is no continuity, the contacts should be replaced. Be sure to check the continuity checker to make sure that it is working properly.

WHEN TO REPLACE CONTACTS

Determination of when to replace contacts should combine both visual inspection and measurement of wear allowance. If there is extreme pitting and curling of the corners, or if the contact has eroded at the corners to a point where the contact bridge is beginning to show, the contacts should be replaced. Even with contacts whose appearance is good, however, they should be replaced if they do not check out satisfactorily on measurement of wear allowance.

DO NOT FILE silver contacts, as all you are doing is removing useful life. Filing of the contacts will neither improve the performance, nor extend the life of the contact.

REPLACEMENT OF CONTACTS

CAUTION: Contacts should never be inspected or replaced without first disconnecting the power at the motor branch circuit disconnecting device. In starters provided with a separate low voltage supply, the separate control source should also be disconnected.

When you have determined that the contacts should be replaced, it is advisable to replace the **STATIONARY CONTACT, MOVABLE CONTACT, AND THE MOVABLE CONTACT SPRING.** Also, if a device is used to control a three-phase motor, it is advisable to replace all of the power pole contacts whenever any one pole needs replacement. Contact kits are readily available containing all of the necessary contacts and springs to make this replacement readily. The contact kit part number providing all the necessary parts for replacement of the contacts is included on the nameplate of the contactor.

Remember, **DO NOT REPLACE CONTACTS UNNECESSARILY;** but when it is necessary, replace all of the power contacts in that device.