

## PROCEDURE FOR BEDDING OF CARBON BRUSHES ON ELECTRICAL MACHINES

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Successful CARBON BRUSH operation is dependent on many factors but the primary factor is proper contact and mechanical stability. There are many circumstances such as irregularities of the best machined comm/ring surface, the brush contact surface itself, variations in pressure etc. which just cannot be eliminated. But there are some factors which are within human control and can be eliminated. Proper bedding of the brushes is one of them.

Improper bedding of brushes on the machine causes reduced and non-uniform contact area which in turn causes increased and unequal current density, reduction of arc of contact and consequently reduction in commutation time & reduction of mechanical stability.

Although it is not generally appreciated but imperfect bedding can cause as serious trouble as sparking; excessive heating; unequal brush wear; streaking of commutator or grooving of slip ring and lack of formation of protective patina. There are a number of other circumstances which can cause these troubles but ensuring proper bedding can eliminate most of these circumstances and their resultant effects to quite an extent.

To achieve proper bedding i.e. 100% apparent contact of all the brush contact surfaces with the comm/rings, certain procedure has to be followed which is described hereafter step by step in full detail:

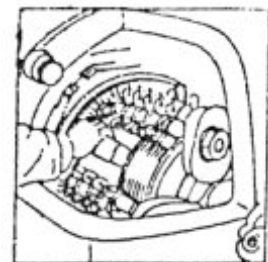
### Step 1

Before starting the bedding, the brushes should be lifted from their brush boxes and their surfaces thoroughly checked. If brush surface is having groove(s) or pit mark, it indicates burr on the commutator surface. Check the commutator surface carefully and try to remove the burr by means of chamfering tool. If it is not possible, take a skin cut, mica under cut and chamfering of comm. segment.

Commutator surface should be free from all oil, dirt or grease. If there is heavy deposit, dark or light Sludge from previously running brushes on the comm/ring, then that should also be removed by wiping with canvas cloth etc.

**Note 1 :** In case the new brush grade is to be used in place of the existing one, the existing fill should be removed by cloth soaked in Carbon Tetrachloride and then black spots can be cleaned by Glass Fiber Stick. If still some hard deposits are observed use the following procedure.

Select a Cleaning Stone as large as practical. With machine running, hold the cleaning stone lightly against the comm/ring & move it slowly back & forth across the face until all 'excess' fill has been removed. Care should be taken not to grind the copper of comm/ring itself otherwise eccentricity may develop.



After each such operation vacuum clean the dust produced. Use of blower or compressed air is not recommended as this may deposit dust on other sensitive parts of the machine. Wipe of all concerned parts with clean dry cloth.

Improper cleaning after any of the steps involved in brush bedding will result in high brush wear or damage to commutator e.g. streaking, threading, grooving etc. Even deterioration of the IR value of the armature can take place.

**Note 2 :** Clearance between brush holder & commutator should be checked & maintained between 2 mm for machines above 1500 rpm and 2.5 mm to 3.8 mm for machines below 1500 rpm.

## Step 2

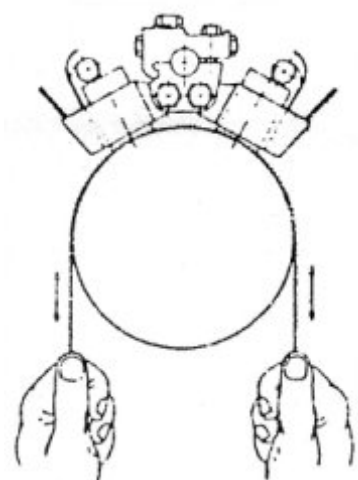
The brushes should be screwed down into their terminals before taking up the bedding operation so that there is no chance of their interchanging in the brush boxes after bedding.

## Step 3

Sufficient care should be taken to fit the brush holders, brush holder arms and the whole brush gear in the specified position and angle. Most important is that uniformity and rigidity should be ensured.

## Step 4

If the contact surface of the brushes is flat, a strip of abrasive cloth made up of synthetic silicon carbide (not glass, sand or emery) 40 grit is used. The strip should be of suitable width i.e. somewhat wider than the axial dimension of the brush and suitable length so that it can be held in both hands. Then the strip is fitted under the brushes (2 or 3 at a time) upside down i.e. abrasive face towards the brush surface and drawn from one side to another. If the brushes have already curved surface this step is not required.



A fresh strip of abrasive cloth of 60/100 grit of width equal to commutator length is wrapped on commutator with 1/6th overlap. The strip is drawn in the direction of rotation of the a/c. in case of radial and trailing brushes. However the strip is drawn against the direction of rotation in case of reaction brushes to be bedded at a time.

The number of pulls of the abrasive strip depends on the amount of deficiency in initial contact. After each one or two pulls some brushes should be taken out and inspected whether the surfaces have been ground full or not. When 80% to 85% surface of brushes have contact with comm/ring, we can proceed with the next step.

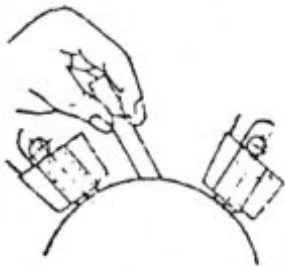
## Step 5

After all the brushes are bedded this way, they should be taken out of their brush boxes and the dust should be vacuum cleaned thoroughly as practicable as possible to avoid its setting down on other parts of the machine. Extreme care should be taken to avoid setting down of the carbonaceous dust on the armature & coils etc. When refitting the brushes full care should be taken to avoid reversing the angle of the brushes in the brush boxes which may lead to many problems.

## Step 6

Even after above operation, the brushes can not be said to be fully bedded because the brush surface is rough. For this a special device called Brush Bedding Stone or Brush Seater has to be used. This is made up of a special material which is very mildly abrasive and the particles are loosely bonded to each other. The size is usually 16x25x100 mm. For actual operation the machine has to be run on low load, but around maximum speed of the machine.

When the machine is running with the brushes, this is carefully held in hand with insulating gloves on. The cross-sectional face of the stick is touched lightly to the running comm/ring just below the entering edge of the brushes. The loosely held particles fly out of the stick, pass between the brush and commutator & grind the brush surface similar to the comm/ring. No grinding or scratching of the comm/ring takes place which should not show any metal pick up. Again individual brushes should be taken out & inspected for how much of bedding/intimate contact has been achieved, & if necessary a second touch should be given.



This operation should be repeated near of just before each arm. If the quality of brush seater is ok this operation should take approx 5-20 seconds. After full contact is achieved the machine should be stopped, brushes taken out and abrasive dust vacuum cleaned thoroughly. The brushes & brush boxes should be wiped off with a piece of cloth because bedding stone dust is somewhat sticky. The brushes should be fitted taking the same precautions described in step 5. At this stage we can say that brushes have near 100% contact.

## Step 7

**RUNNING IN :** After the bedding has been completed as above the next step to be followed is Running In of the machine. This comprises of starting the machine at light load and gradually increasing the load so that sparking/chatter etc. is not observed. This way the brush Kill take a fuller and more intimate contact with the comm/ring which will also start developing a fill/patina which is most essential for brush operation.

In no case the machine should be allowed to run without load or on underload for this purpose because that will defeat the very purpose brush bedding.

At the outset the above procedure would appear to be:

1. Cumbersome.
2. Time consuming.
3. Requiring extra man power/man hours.
4. Apparently increasing the cost.
5. During maintenance, access to the brushes and holders is difficult, sometimes impossible.

However, we should consider the enormous advantages of proper brush bedding which will more than offset the above disadvantages specially extra costs.

Full and intimate contact of the brush with comm/ring at the starting stage is not only essential but very advantages for successful performance and life of machine, brush and brush gear.