HELWIG BRUSH FACE CONDITION GUIDE

BRUSH FACE TROUBLESHOOTING & CARBON BRUSH INSTALLATION

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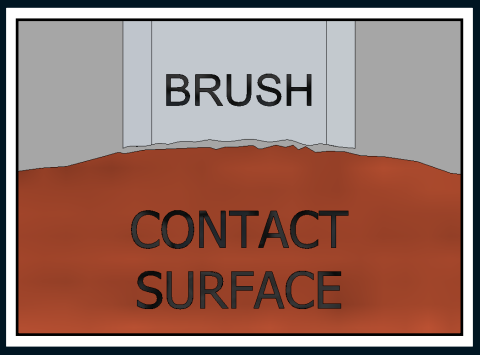

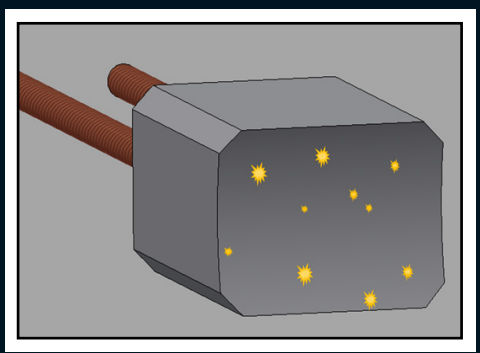

HELWIG® CARBON PRODUCTS, INC.

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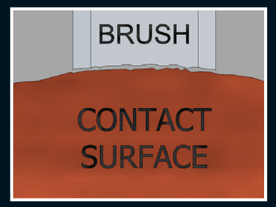
What is happening at the brush face?

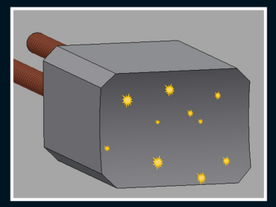
Microscopic Level

- Two contact surfaces are not making full contact
- Unlike in theory, practical current
- density is always higher



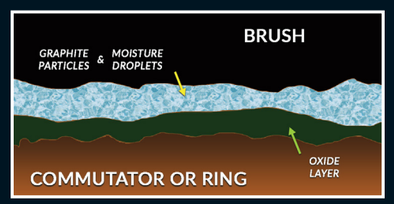
Contact Points

- Current flows through few but constantly changing contact points based on quality of contact
- Number of contact points depends on current level, surface finish, TIR, spring force, vibration, etc.



Patina or Film Formation

- Often referred as brush track, patina will vary for different grades, current density, humidity, and other atmospheric conditions
- Typically the patina is desired to reduce friction and extend life of both contact

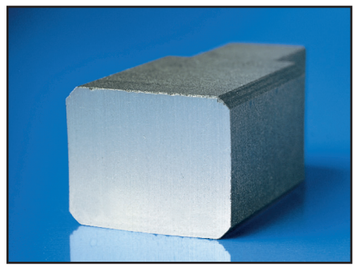


BRUSH FACE CONDITIONS

Smooth

Appearance
- Dense, shining sliding face

Causes
- Normal Operation

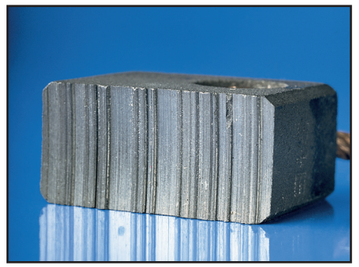


Threading or Hairlining

Appearance
- Tracking with hairling and grooves

Causes
- Underload
- Weak spring force

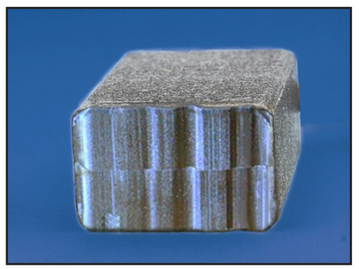
Note: Vibrations and contamination can aggravate the situation



Contamination

Appearance
- Inconsistent surface
- Grayish streaks
- For metal grades: localized burning that appears as black spots

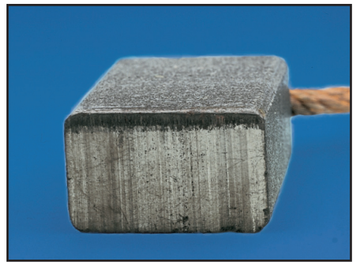
Causes
- Influence of foreign particles such as oil, grease, or other chemicals



Edge Burning

Appearance
- Burning of the trailing edge

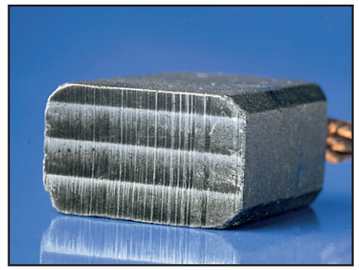
Causes
- Difficult commutation
- Out of neutral
- Heavy sparking
- Weak spring force



Lamination

Appearance
- Lamination of sliding face
- Burned segments of the sliding face

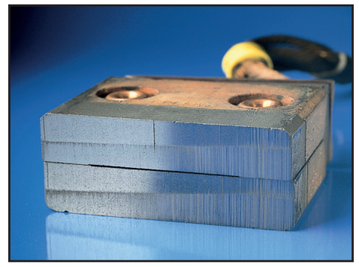
Causes
- Winding fault giving voltage surge during commutation



Double Facing

Appearance
- Double facing **he**re for a twin brush

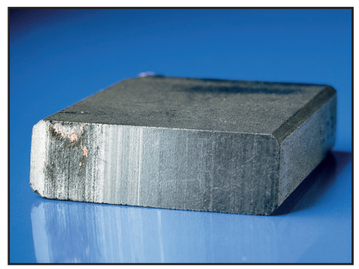
Causes
- Tilting of the brush in dual direction or reversing machine
- Too much clearance between brush & holder



Copper Picking

Appearance
- Copper nests
- Softened copper from the contact surface

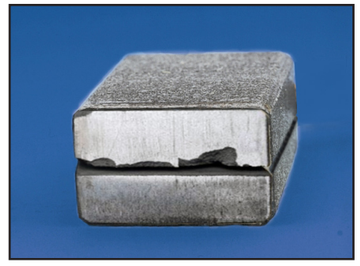
Causes
- High resistance contact
- Abrasive grade
- Weak spring force
- Vibration from external or internal sources



Chipping

Appearance
- Broken edges

Causes
- Excess brush movement
- Surface roughness
- Out of round condition
- High points/bars
- Weak spring force
- Excess vibration
- High frequency chatter due to light load



BRUSH FACE SUMMARY

It would be premature to blame the brushes or the carbon grade for fast wear problems. The appearance of the worn brush is telling you a story about operating conditions.

Follow These Steps

- Identify the warning signs by looking at the used brush face.
- Instead of throwing away used brushes, take clear pictures of some or save a few that best represents all of the other brushes.
- Involve a carbon brush specialist, preferably one who knows how different carbons are made at the composition level.

This will help you to resolve issues with operating conditions outside the scope of carbon brushes and extend the life of your motor or generator.

In summary, the worn carbon brush face tells a story about the operating conditions. Analysis performed by carbon brush experts can be utilized as a diagnostic tool to conduct a root cause analysis. If the warning signs presented by abnormal brush wear can be identified and proactively addressed in a timely manner, unexpected and expensive failures, such as flashover, can be avoided.

HELWIG® CARBON PRODUCTS, INC.

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- Spring assemblies
- Press-to-size product line for high volume runs

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- Material analysis and development
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- Lift Trucks
- Off Road Vehicles
- Food Processing
- Automotive
- Medical
- Household Appliances
- Any market that uses a motor!

CARBON BRUSH

Installation Steps

1. **Disconnect the power** to the machine using approved lock-out procedures.
2. **Remove all old brushes** from the holders. Make note of any unusual conditions of the brushes including: roughness or burning of the contact face, polished sides on the carbon, excess heat on the wires, or frayed shunt wires. Unusual brush conditions are indications of the need for an improved brush design or for maintenance on the machine.
3. **Inspect the commutator** for unusual conditions for high bars and mica. Make note for required maintenance.
4. **Check inside holder cavity** for dust, dirt, oil, deposits, carbon buildup, corrosion, or burned areas and clean as needed.
5. **Check the terminal connection** area and clean, as needed.
6. **Brush holders should be secured** to their mount and checked that none have become loosened or are out of alignment.
7. **Measure spring force** to ensure there is consistent contact force at the recommended level. Use the measured force to calculate the spring pressure for comparison with Helwig's recommended levels.
8. **Remove old film** from the brush tracks, if the new brushes are made from a different grade. Use dry, untreated canvas applied with a pressure block or a rubber abrasive. A seater stone can be used as an alternative. However, the remaining dust must be vacuumed or blown out of the machine.
9. **Install new brushes** in all holders with attention to the orientation on angled designs. Ensure that the brushes can move freely in the radial direction.
10. **Apply the pressure spring** to the top of the brush.
11. **Pull up on the brush** and allow to gently return to contact with the commutator or ring to ensure there is no binding of the brush and spring.
12. **Connect the terminals.** Be sure all terminal connections are tight and secure.
13. **Seat the brushes** to the contour of the commutator using non-metal bearing sandpaper or garnet paper. Do NOT use emery. Medium coarse grade paper pulled under the brush face in the direction of rotation improves the quality of the brush contact surface and speeds the process.
14. **Operate the machine at no load** for the final wear-in contour of the contact surfaces in order to ensure complete electrical contact of the brushes. This procedure allows the brush to make intimate contact in its operating position in the holder.
15. **The machine is ready for use.** The film process on the contact surface can be enhanced with the use of an untreated hardwood burnishing block or a rubber polishing stone. This procedure can reduce the high friction and brush dust developed during the initial film forming period.

NOTE: In some cases, time restraints, operating conditions, or performance issues may require the replacement of less than a full set of brushes without normal seating. Then, it is especially important to adhere to step 14 with extended operation at no-load.

Shortcuts on procedures for brush installation will result in excess electrical damage to the brush face and the contact surface.

Contact Helwig's Expert Technical Services Staff

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