

Technical Information

Oil and grease

Greases and mineral oils are polymerised, organic components.

In mechanical and electrical construction oils or greases are widely used for lubricating purposes, e.g. in bearings, clutches, gear boxes etc.

Due to leakage, defective bearings, excessive greasing etc. the access of oil or its components to the contact surface of carbon brushes is possible.

Effect on brushes

Unfortunately oils have severely adverse effects on the performance of brushes.

In a totally enclosed compartment without external fresh air, e.g. in earthing contacts, an irregular and very high rate of brush wear occurs, which can reach or exceed 5 to 10 times normal. Beside the wear of the brushes the commutator (or ring) surface might be damaged by groove formation.

Wear is especially high when:

- The oils or greases have a very low boiling point.
- The volume of air available to the machine is restricted
- The internal temperature of the machine and especially that of the commutator (or ring) is high,
- The current passing through the brushes is high.

Causes

According to observations made in laboratories and in the field, it is the products of hot distillation of the oils which bring about the unusual brush wear because of:

- Condensation on the commutator (or the rings/ discs) forming an insulation film which disturbs the passage of the current and causes arcs or sparking underneath the brushes
- Decomposition of oil vapour under sparking conditions with the formation of so called oil coke, which is a very hard, abrasive agent for the brushes It has also been confirmed, that:
- Even at a very small vapour pressure corresponding to an unmeasurable loss of weight of the oil, the performance of the brush will be adversely affected in the enclosed and warm environment of a machine on full load.
- Quite high oil vapour pressure in a closed environment do not have any visible effect to the brushes when the machine is running at minimum load or under no load running periods.

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Remedial actions

From the brushes point of view only one remedy is really field proven:

- Use of a polishing brush of marked abrasiveness in order to remove the contamination left by the oil.

Small and medium sized DC machines (up to frame size 280)

- Resin bonded graphite grades have got a certain amount of impurities due to the use of natural graphite as raw material. They can be used with up to 4 brushes in parallel and a maximum permanent current density 10 A/cm^2 .

Medium sized and large DC machines (frame size larger 300)

- Electrographite grades with special treatment provide a distinct self-cleaning effect.

Asynchronous slip ring machines

- All brushes in service on those machines do have a distinct polishing effect due to its natural ingredients. Nevertheless some grades are more suitable than others. The grade selection depends on the actual current and the specific application.

Earthing contacts

- All brushes in service in earthing contacts do have a distinct polishing effect due to its natural ingredients. Nevertheless some grades are more suitable than others. The grade selection depends on the actual current.
- The modern carbon / carbon contact designs are especially affected by possible oil contamination. The soft carbon material is particularly prone to high wear of the brushes and the discs as well by means of the hard oil residues.
- **Due to the totally enclosed compartment even small amounts of oil have a negative influence on the contacts performance. Full improvement can not be managed by an alternative brush material only, but only by preventing the access of the oil into the earthing contact itself.**

In some extreme cases even so called cleaning brushes can be used. Brushes with a very high content of abrasive ingredients are mixed with standard brush grades.

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The only real remedy consists in suppressing the cause, that is to say, to prevent the accumulation of oil vapour around the brush:

- Either by preventing the access of oil into the motor or earthing contact,
- or by ventilating the brushes with fresh air in permanent and plentiful supply.

Compact

- oils are toxic for carbon brushes.
- They form an insulation film. By brush sparking oils can be decomposed to a hard, glassy coke.
- Brush wear can rise to 5 to 10 times normal
- The counter material can be damaged by groove formation.
- Abrasive brush grades can give some improvement
- Good ventilation with fresh air will also improve the situation
- Oil has to be prevented from the access to earthing contacts.