

Lesson 7: Construction of Elementary Dc Generators

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ET 332A
DC MOTORS, GENERATORS AND ENERGY
CONVERSION DEVICES

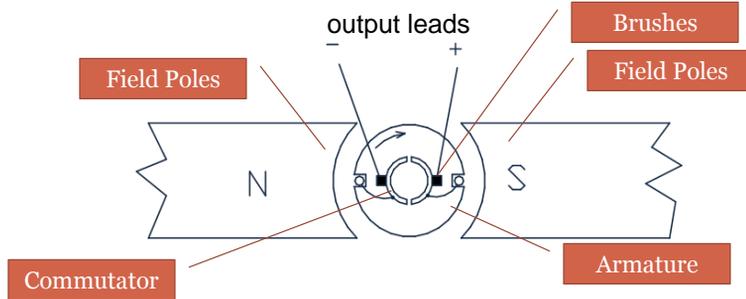
Learning Objectives

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After this presentation you will be able to:

- List the parts and explain the function of a dc machine
- Identify the commutator of a dc machine and explain how it operates on a dc machine
- Explain armature reaction and how interpoles improve dc machine performance

Construction of Elementary Dc Generator



Field poles - produce the main magnetic field of the machine (permanent magnet or electromagnet)

Armature - rotating part of the machine. Holds coils where induced voltage is developed.

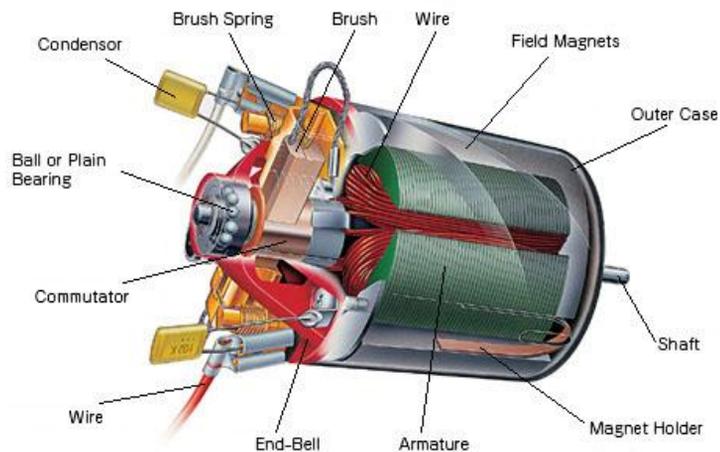
Commutator - connect armature coils to the brushes. Commutator and brushes act as mechanical rectifier.

Brushes - pick up current and voltage from armature. Remain fixed while armature spins.

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Construction of Elementary Dc Generator

Pictorial Diagram of small dc machine

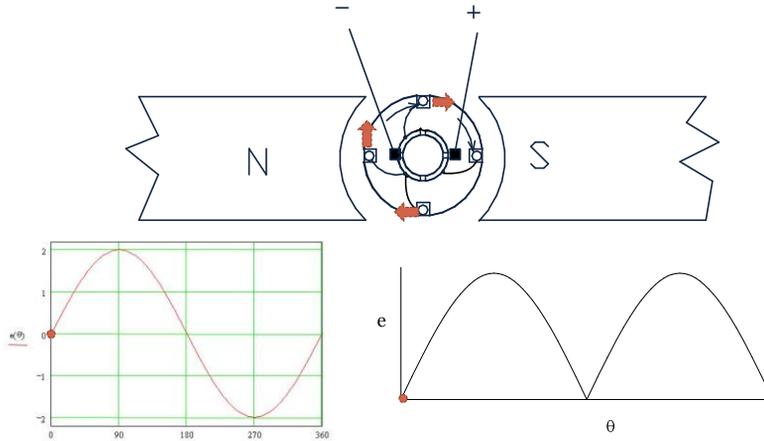


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Commutation in Elementary Dc Machines

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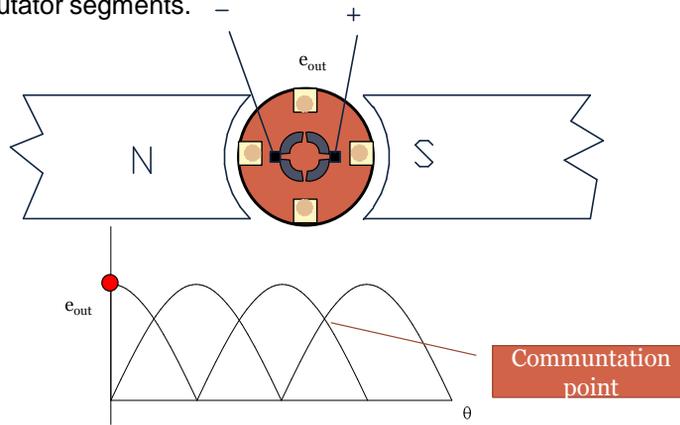
Induced voltage is sinusoidal. Commutator and brushes act as mechanical rectifier to always connect positive voltage to the same terminal.



Effects of Adding More Armature Coils

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Two coils require four commutator segments. Adding more coils and commutator segments gives smoother dc output. Each coil needs 2 commutator segments.



Commutator Details

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Commutator combined with Brushes forms a mechanical rectifier

Insulation

Copper Segments



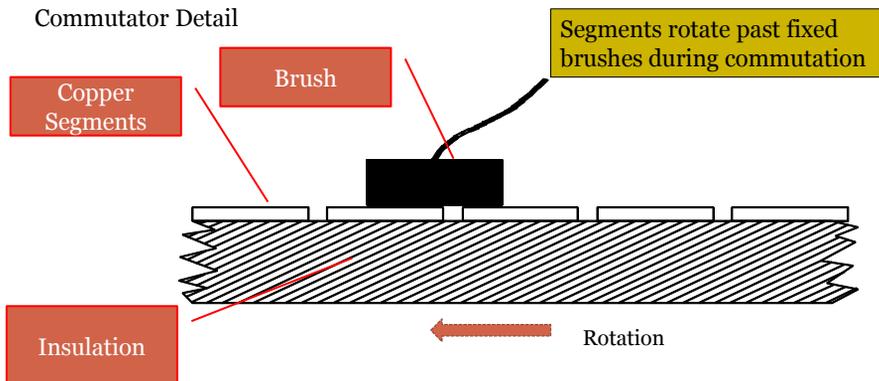
Segments connect the armature coils to the load through the brushes.

Commutation Process

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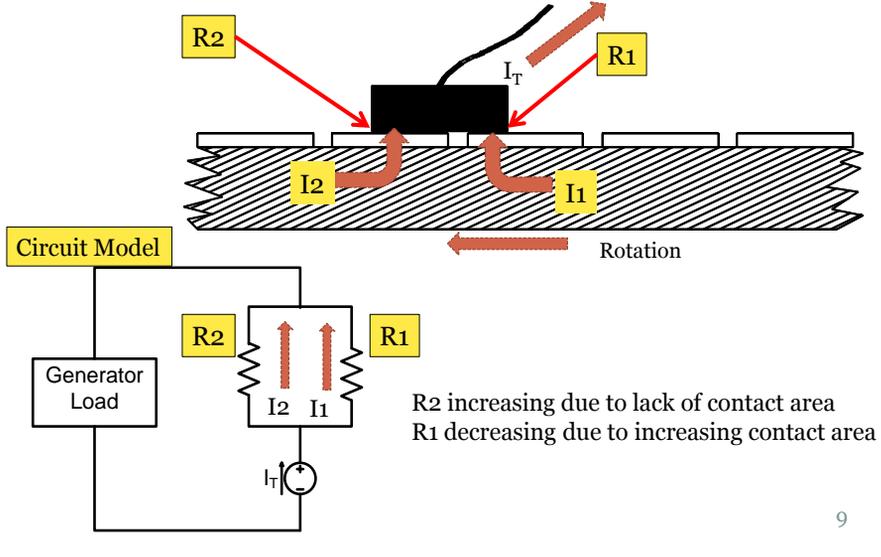
Commutation - switching or reversing of current in a circuit

Commutator Detail



Commutation Process

Resistance commutation - uses contact resistance of brush commutator to switch the current in the motor or generator coils.



Brush Position Affects Commutation

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Good commutation takes place with zero voltage across brushes

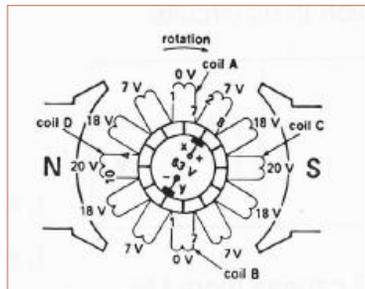


Figure 4-12 Moving the brushes off the neutral point reduces the output voltage and produces sparking.

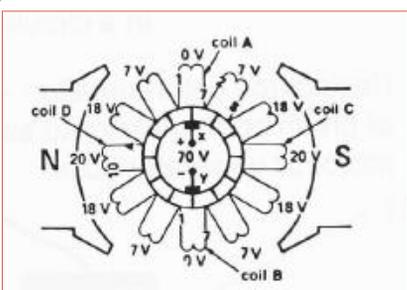


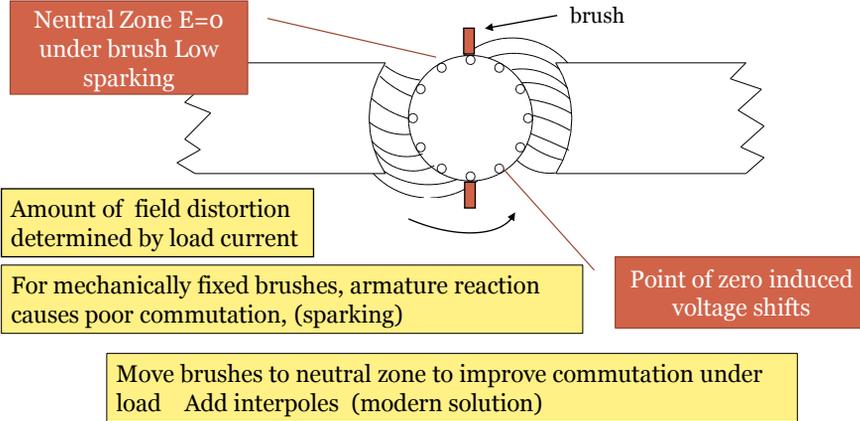
Figure 4-11b Schematic diagram of the armature and the voltages induced in the 12 coils.

Commutation above 2-3 V causes sparking and reduced terminal V

Armature Reaction and Commutation

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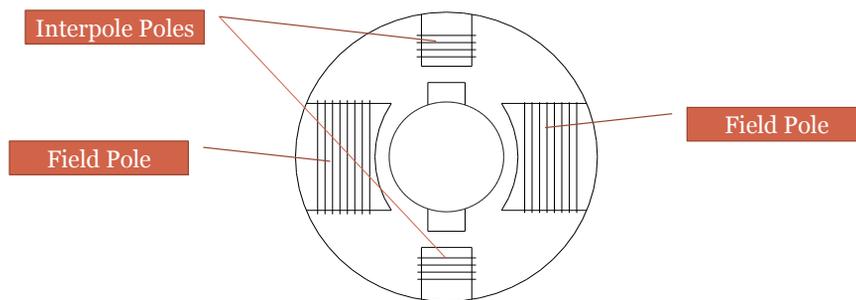
Armature reaction - distortion of the field flux distribution due to load current in armature

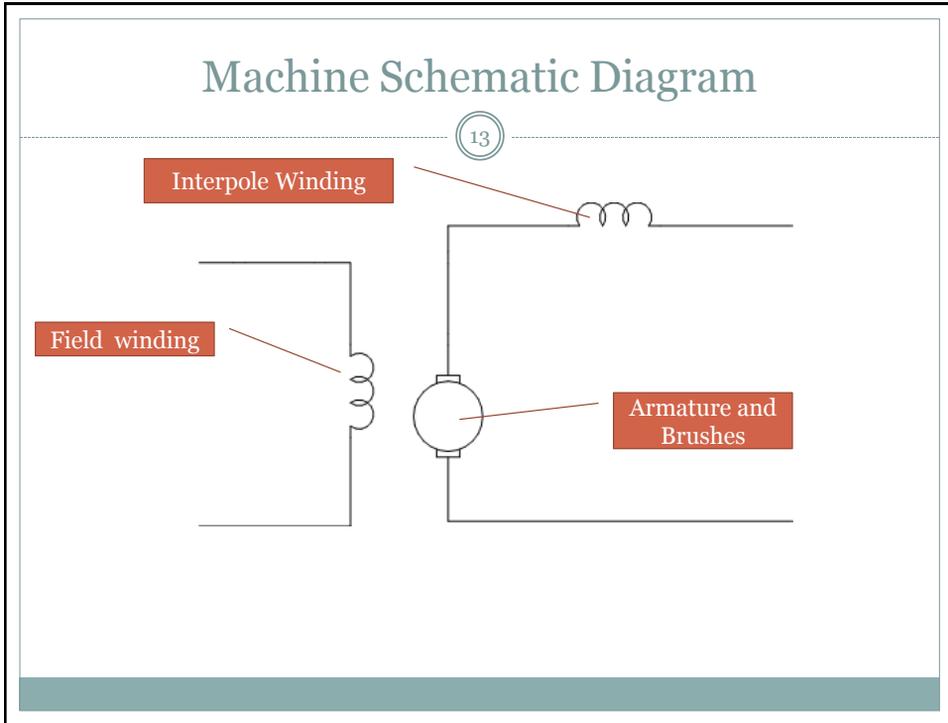


Interpoles (Commutating Poles)

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Interpole constructed on a few turns of heavy gage wire. Carries load current. Produces cancelling mmf so flux distortion is minimized.





End Lesson 7: Construction of Elementary Dc Generators

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