



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)



COIMBATORE-35

**Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

COURSE NAME: 19EEB210 / Electrical Machines and Drives

II YEAR / IV SEMESTER

Unit III – SPEED CONTROL TECHNIQUES

Topic : Electrical Braking and its types

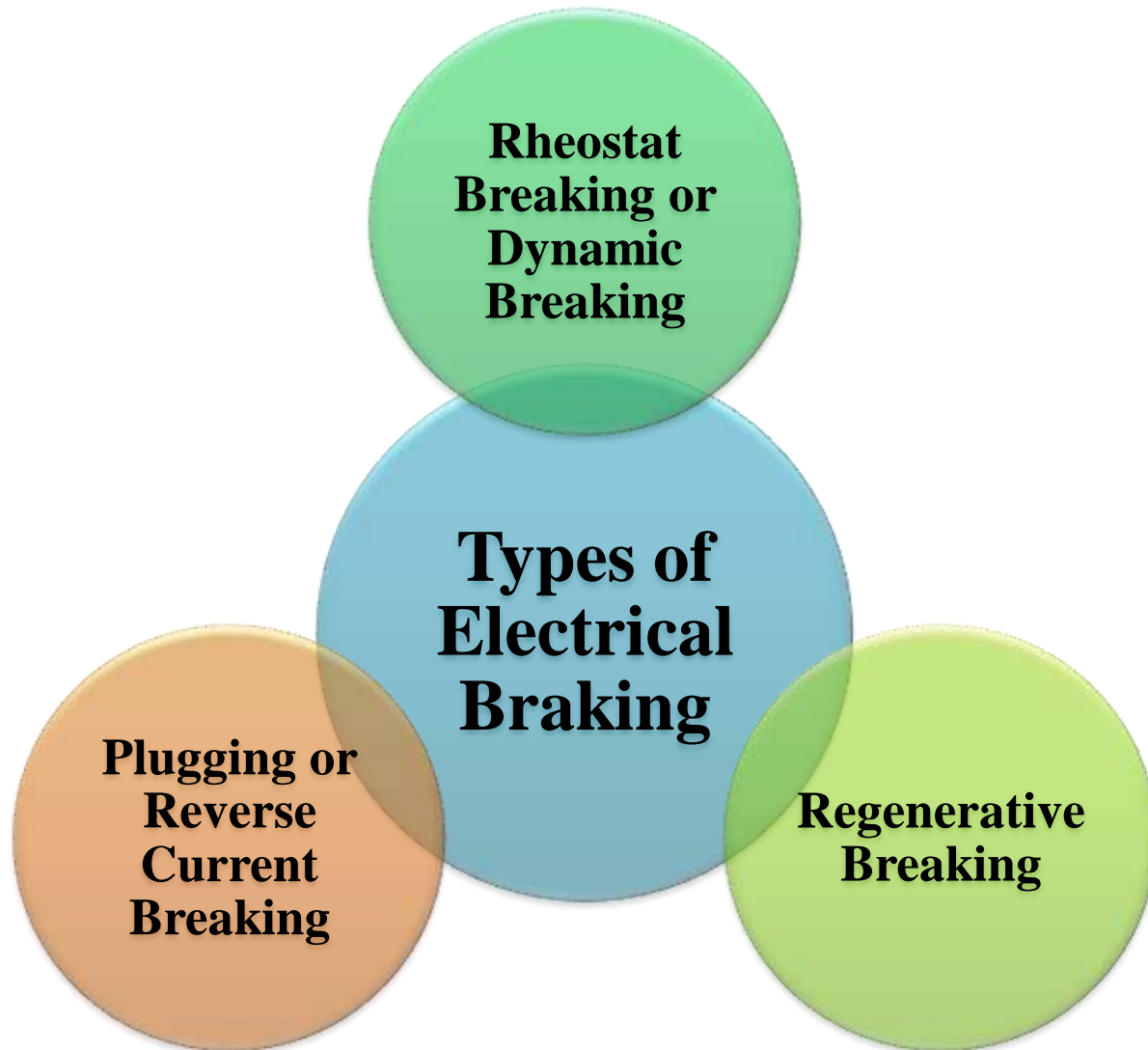


ELECTRICAL BRAKING

- The DC motors can be stopped using one of the following methods –
 - Mechanical (Friction) Breaking
 - Electric Breaking
- In **mechanical breaking**, the motor is stopped due to friction between the moving parts of the motor and the break shoe. The mechanical breaking has several disadvantages as non-smooth stop, wear and tear of moving parts, breaking power wasted as heat and greater stopping time etc.
- In **electric breaking**, the kinetic energy of moving parts of the motor is converted into electrical energy which is either dissipated in a resistance or returned to the supply source.



ELECTRICAL BRAKING



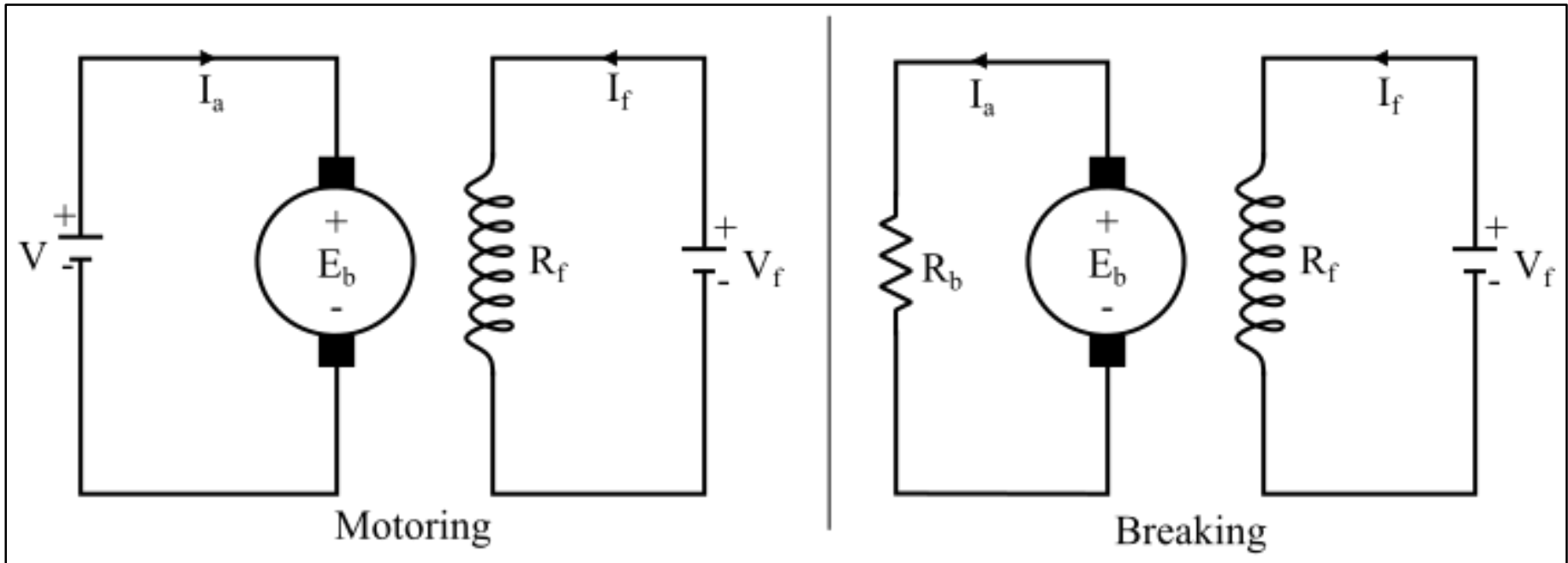


RHEOSTAT BRAKING OR DYNAMIC BRAKING

- In dynamic braking, the armature of running DC motor is disconnected from the supply and is connected across a braking resistance R_b (Rheostat Braking).
- The field winding is left connected to the supply. Hence, the motor now works as a generator and producing a braking torque.
- During dynamic electric braking when the motor works as a generator, the kinetic energy of moving parts of the motor is converted into electrical energy and is dissipated in the form of heat in the braking resistance R_b and the armature circuit resistance R_a . As a result, the motor is brought to standstill quickly.
- The dynamic braking or rheostat braking is an inefficient method of braking since all the generated energy is dissipated in the form heat in the resistance.



RHEOSTAT BRAKING OR DYNAMIC BRAKING





REGENERATIVE BRAKING

- In regenerative braking, the motor is operated as a generator so the kinetic energy of the moving parts of the motor is converted into electrical energy.
- This electrical is then returned to the supply source. This action slows down the motor.
- The regenerative braking is only possible when the driven load forces the motor to run at a speed greater than the no-load speed with a constant field excitation.
- Under this condition, the back EMF (E_b) of the motor is more than the supply voltage, which reverses the armature current of the motor.
- Therefore, the motor now begins to operate as a generator and the generated electrical energy is transferred to the supply source.



REGENERATIVE BRAKING

- The regenerative breaking cannot be used for stopping the motor. It is just used for controlling the speed above the no-load speed of the DC motors.
- The necessary condition for the regenerative breaking is that the back EMF of the motor must be greater than the supply voltage, so that the armature current is reversed and the motoring operation is changed to the generating operation.
- The regenerative breaking is mainly used to control the speed of DC motors driving the loads such as electric locomotives, elevators, cranes and hoists etc.



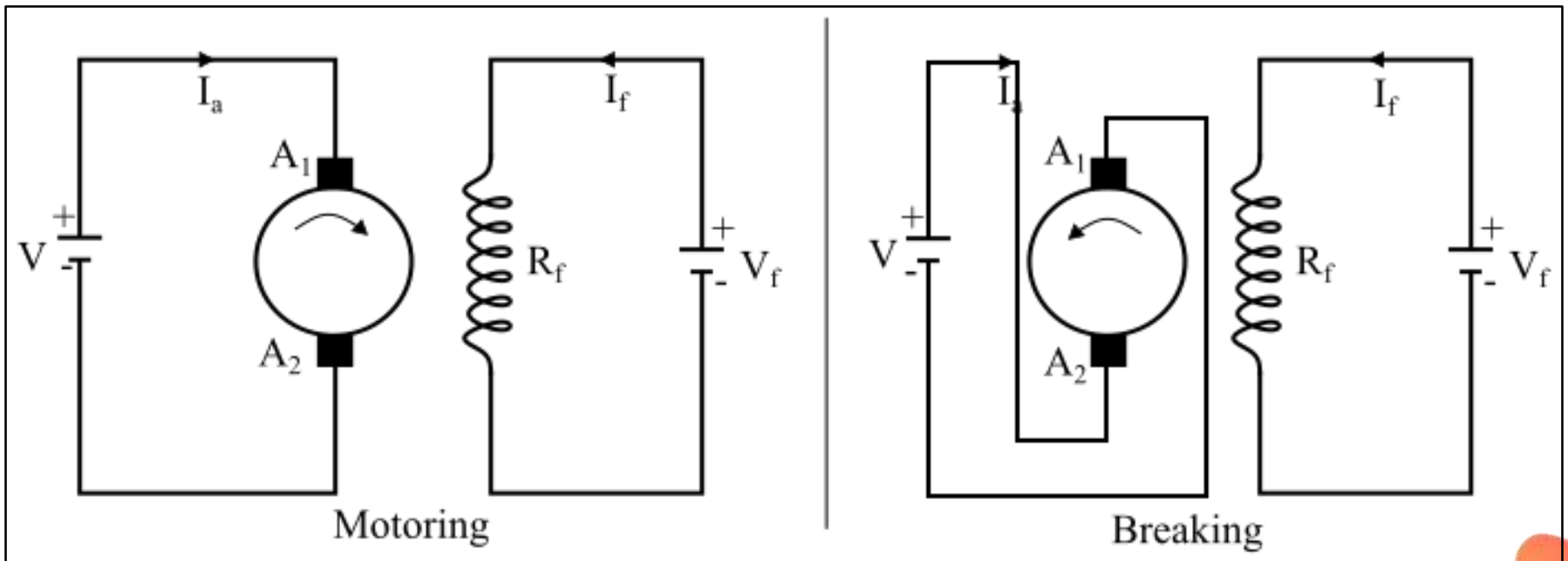
PLUGGING OR REVERSE CURRENT BRAKING

- In the plugging or reverse current braking, the connections of the armature are reversed so that the motor tends to rotate in the opposite direction and provides the necessary braking effect.
- When the motor comes to rest, the supply source must be disconnected otherwise the motor will start rotating in the opposite direction.
- When the armature connections are reversed, the supply voltage and the back EMF will act in the same direction.
- Hence, during the braking the resultant voltage across the armature will be equal to $(V+E_b)$, which is approximately double of the supply voltage
- . This reverses the armature current and hence a high braking torque is produced.
- To limit the armature current to a safe value, a current limiting resistor is connected in series with the armature.



PLUGGING OR REVERSE CURRENT BRAKING

- The plugging is a highly inefficient method of braking since the power supplied by the moving parts as well as power supplied by the source is wasted in resistances.
- The plugging is mainly used in controlling rolling mills, elevators, machine tools and printing presses etc.





KEEP
LEARNING.

Thank u

SEE YOU IN NEXT CLASS