SNS COLLEGE OF ENGINEERING

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AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEM ANALYSIS
UNIT – I
FUNDAMENTALS OF PERMANENT MAGNETS

INTRODUCTION:

BLDC motors are one of the motors gaining more popularity. These motors are used in industries such as

* Automotive
* Aerospace
* Medical
* Industrial automation equipment
* Instrumentation

BLDC motors do not use brushes for commutation instead they are electronically commutated.

BLDC motors have many advantages over brushed DC motors and AC motors. They are

* Better speed torque characteristics
* High efficiency
* High dynamic response.
* Long operating life
* Noiseless operation.
* High speed ranges.

Fundamentals of Permanent Magnet Materials

Motors using permanent magnets can be broadly classified as follows.

1) Conventional dc PM motors :

Whose armature, commutator and brushes are the same as that of a normal dc motor except that the field winding in the stator is replaced by PM.

2) PM BL DC Motors :

The construction is similar to a synchronous motor with armature windings in stator but whose field windings in the rotor is replaced by PM and the commutation of currents in the stator is carried out electronically.

PM materials used in these m/c's are:

* Different grades of Alnico (an alloy of aluminium), Nickel, Cobalt, iron.
  - ↳ Depending on the quality, they are graded as Alnico 5, Alnico 7, Alnico 9
  - ↳ The higher the number, the better

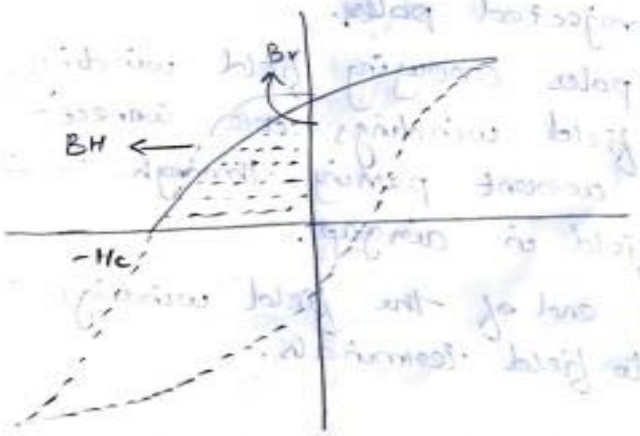
ie higher energy density $(BH)_{max}$ product.

* Ceramic (or) ferrite magnets :
  - ↳ These have lower B_r but higher H_c.
  - ↳ They are cheaper.

* Samarium cobalt ($SmCo$) :
  - ↳ These are high energy density magnets with large B_r and also high coercive force H_c.

* NdFeB magnets are alloy of Neodymium iron and Boron.
  - ↳ These have so far the highest $(BH)_{max}$ product.

Magnetic characteristics.



Where B_r - flux density

H_c - Coercive magnetic force.