ELECTRICAL MACHINE DESIGN

TEXT BOOK

1. Sawhney A. K. , “A Course in Electrical Machine Design”, 6th edition, Dhanpat Rai and Sons, 2006

REFERENCES

1. Agarwal, R. K., “Principles of electrical machine design”, S. K. Kataria and Sons, 2002
2. Mittle, V. N. and Mittle, A., “Design of Elctrical machines”, Standard Publications and Distributors, 2002

What is Meant by Electrical Machine Design

- Design may be defined as a creative physical realisation of theoretical concepts.
- Engineering design is applicable of science , technology and inventions to produce machines to perform specified tasks with optimum economy and efficiency.

Basic Consideration to Develop A Design are

1. Design Base

- Matching the existing experiences with R and D
- Bringing in the latest material technology
- Limitations in design
- Convenience to produce production line and transportation
- Working safely and reliability
- Maintenance and repair
- Environmental conditions

2. Specifications

Meeting with customer requirement

Satisfy the national and internationals standards

3. Design Transfer

Transfer of design to factory foreman i.e. drawings, processes instructions, job flow, meeting the delivery schedule.

4. Information Updating

Technical journals, R and D papers and reports interaction in meeting, seminars and conferences.

Major Consideration to Develop a design are

The design should be carried out based on the gives specifications using available materials economically and to achieve the following

1. Lower cost
2. Durability
3. Conformity with performance criteria laid don in specifications

Limitation in Design

1. Saturation of Magnetic Parts

Increase core losses and excitation at highest flux density resulting in higher cost for the field system

2. Temperature Rise

Increased temperature rise under higher output weakens the insulation and affect the life of a machines

3. Insulation

It should be able to withstand the electrical mechanical and thermal stress which are produced in the machine.

4. Mechanical Strength

Specially in the turbo machine due to the large size and high speed

5. Efficiency

If high efficiency is the aim the machine becomes costly for lower efficiency higher running cost, and temperature rise with associated problems

6. Customer's Specification

Imposes limitation to identify criterion for best design

7. Commutation

In the pc machines output is limited because of commutation problem

8. Power Factor

Power factor imposes a limitations specially in case of 3 phase induction motor

9. Standards Specification

Specification is the biggest strain on the design because both the manufacture as well as the consumers can not get away from them without satisfying them.

Basic Structure of Electrical Machines

1. Magnetic circuit

Core , Yoke , Air Gap Etc.

2. Electric Circuit

Stator , Rotor Winding and Transformer Winding

3. Dielectric Circuit

Insulation

4. Thermal Circuit

Heating and Cooling Medium

5. Mechanical Parts

Frame, Bearing and Shaft