SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 2EEB210 / Electrical Machines and Drives

II YEAR / IV SEMESTER

Unit I – ELECTRICAL MOTORS

Topic : SELECTION OF POWER RATING OF MOTORS

SELECTION OF POWER RATING OF MOTORS

From the point of view of motor rating for various duty cycles in section 1.6 can be broadly classified as:

- Continuous duty and constant load
- Continuous duty and variable load
- Short time rating

1. Continuous duty and constant load

If the motor has load torque of T N-m and it is running at ω radians/seconds, if efficiency in η , then power rating of the motor is

$$P = \frac{T\omega}{1000} KW$$

Power rating is calculated and then a motor with next higher power rating from commercially available rating is selected.

Obviously, motor speed should also match load‟s speed requirement .It is also necessary to check whether the motor can fulfill starting torque requirement also

SELECTION OF POWER RATING OF MOTORS

2. Continuous duty and variable load

- The operating temperature of a motor should never exceed the maximum permissible temperature, because it will result in deterioration and breakdown of insulation and will shorten the service life of motors.
- It is general practice to base the motor power ratings on a standard value of temperature, say 35_o c.
- Accordingly, the power given on the name plate of a motor corresponds to the power which the motor is capable of delivering without overheating at an ambient temperature of 35 c. the duty cycle is closely related to temperature and is generally taken to include the environmental factors also.

SELECTION OF POWER RATING OF MOTORS

The rating of a machine can be determined from heating considerations.

- However the motor so selected should be checked for its overload capacity and starting torque.
- This is because, the motor selected purely on the basis of heating may not be able to meet the mechanical requirements of the basis of heating may not be able to meet the mechanical requirements of the load to be driven by it.
- The majority of electric machines used in drives operate continuously at a constant or only slightly variable load.
- The selection of the motor capacity for these applications is fairly simple in case the approximate constant power input is known
- In many applications, the power input required for a motor is not known before hand and therefore certain difficulties arise in such cases.
- For the determination of ratings of machines whose load characteristics have not been thoroughly studied, it becomes necessary to determine the load diagram i.e., diagram shown the variation of power output versus time.

SELECTION OF POWER RATING OF MOTORS

The temperature of the motor changes continuously when the load is variable. On account of this, it becomes difficult to select the motor rating as per heating.

The analytical study of heating becomes highly complicated if the load diagram is irregular in shape or when it has a large number of steps.

Therefore it becomes extremely difficult to select the motor capacity through analysis of the load diagram due to select the motor capacity through analysis of the load diagram due to lack of accuracy of this method.

On the other hand it is not correct to select the motor according to the lowest or highest load because the motor would be overloaded in the first case and under loaded in the second case.

Therefore it becomes necessary to adopt suitable methods for the determination of motor ratings.

SELECTION OF POWER RATING OF MOTORS

Short time rating of motor

An electric motor of rated power P r subjected to its rated load continuously reaches its permissible temperature rise after due to time. If the same motor is to be used for short time duty, it can take up more load for a short period without increasing the maximum permissible temperature of the motor during this period.

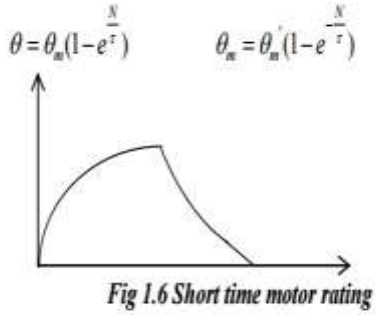

Fig 1.6 Short time motor rating

Where=operating time under rated load

θm =maximum permissible temperature which the motor running on short time rating will reach if run continuously at that rating.

SELECTION OF POWER RATING OF MOTORS

θm = Maximum permissible temperature rise of the motor run continuously at continuous rating.

If it is assumed that the temperature rise is proportional to losses corresponding to the rating of the motor.

$$\frac{\theta_m'}{\theta_m} = \frac{W_x}{W_r} = \frac{1}{(1-e^{-\frac{N}{\tau}})}$$

The ratings of the motor will be proportional to the losses .If P_x is the short time load P_r is the continuous rating of the motor, losses for continuous rating are,

$$W_r = W_{const} + W_{cu}$$

$$W_x = W_{const+}(\frac{P_x}{P_r})^2 W_{cu}$$

The ratio of $\frac{P_x}{P_r}$ can be determined.

KEEP
LEARNING.

Thank u

SEE YOU IN NEXT CLASS