SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-

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: 16EE214/ELECTRICAL MACHINES AND DRIVES

III YEAR / VI SEMESTER

UNIT 1- OVERVIEW OF ELECTRICAL DRIVE

Topic 4 – Heating and cooling curves

SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful

HEATING TIME CONSTANT

Heating time constant is defined as the time taken by the machine to attain 0.623 of

its final steady temperature rise.

When t= t,
q = qm(1- e-1)
q = 0.632qm

The heating time constant of the machine is the index of time taken by the machine to attain
its final steady temperature rise

HEATING AND COOLING CURVES

- We know that $\tau = \frac{Gh}{s\lambda}$, therefore, the time constant is inversely proportional to has a larger Value for ventilated machines and thus the value of their heating time constant is small.

The value of heating time constant is larger for poorly ventilated machines with large or totally enclosed machines, the heating time constant may reach several hours or even days.

- When a hot body is cooling due to reduction of the losses developed in it, the temperature time curve is again an exponential function

$$\theta = \theta_f + (\theta_i - \theta_f)e^{\frac{t}{\tau}} \quad \text{----------(4)}$$

HEATING AND COOLING CURVES

Where,

θ_f =final temperature drop (the temperature at which whatever heat is generated is dissipated)

$\frac{p}{s\lambda'}$ = where, λ is rate of heat dissipation while cooling

θ_i = the temperature rise above ambient in the body at time t=0

τ' = cooling time constant= $\frac{Gh}{s\lambda'}$

If motor where disconnected from supply during cooling, there would be no losses taking place and hence, final temperature reached will be the ambient temperature.

Therefore, θf =0 and hence equation (4) becomes

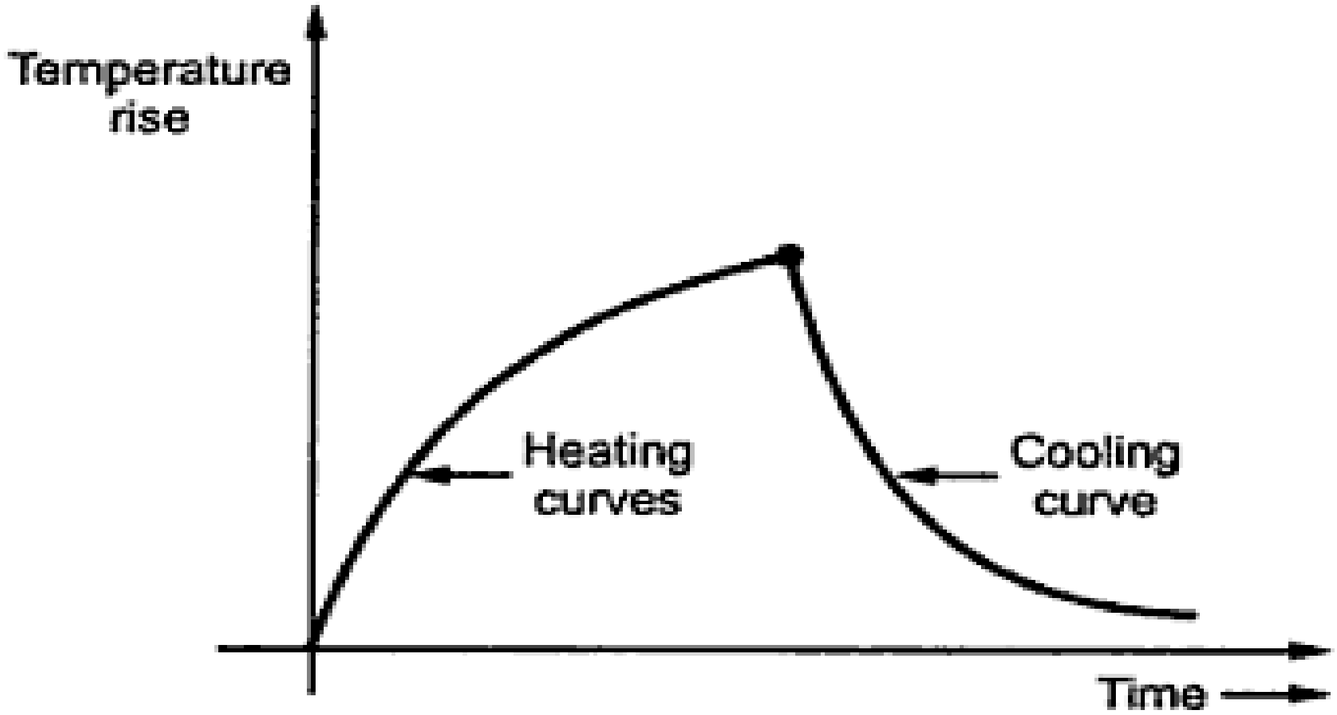
$$\theta = \theta_{ie}^{\frac{1}{\tau'}}$$

Cooling time constant

At t=t',$q = 0.368qi$

Cooling time constant is, therefore, defined as the time required cooling the machine down to 0.368 times the initial temperature rise above ambient temperature.

HEATING AND COOLING CURVES



ASSESSMENT

REFERENCE

- D.P.Kothari and I.J.Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill publishing company ltd, second edition, 2007

- S.K.Pillai, “ A First Course on Electrical Drives” New age publishing Ltd, 1989. (UNIT I, IV,V)

THANK YOU!!