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: 19EET207/ SYNCHRONOUS AND INDUCTION MACHINES

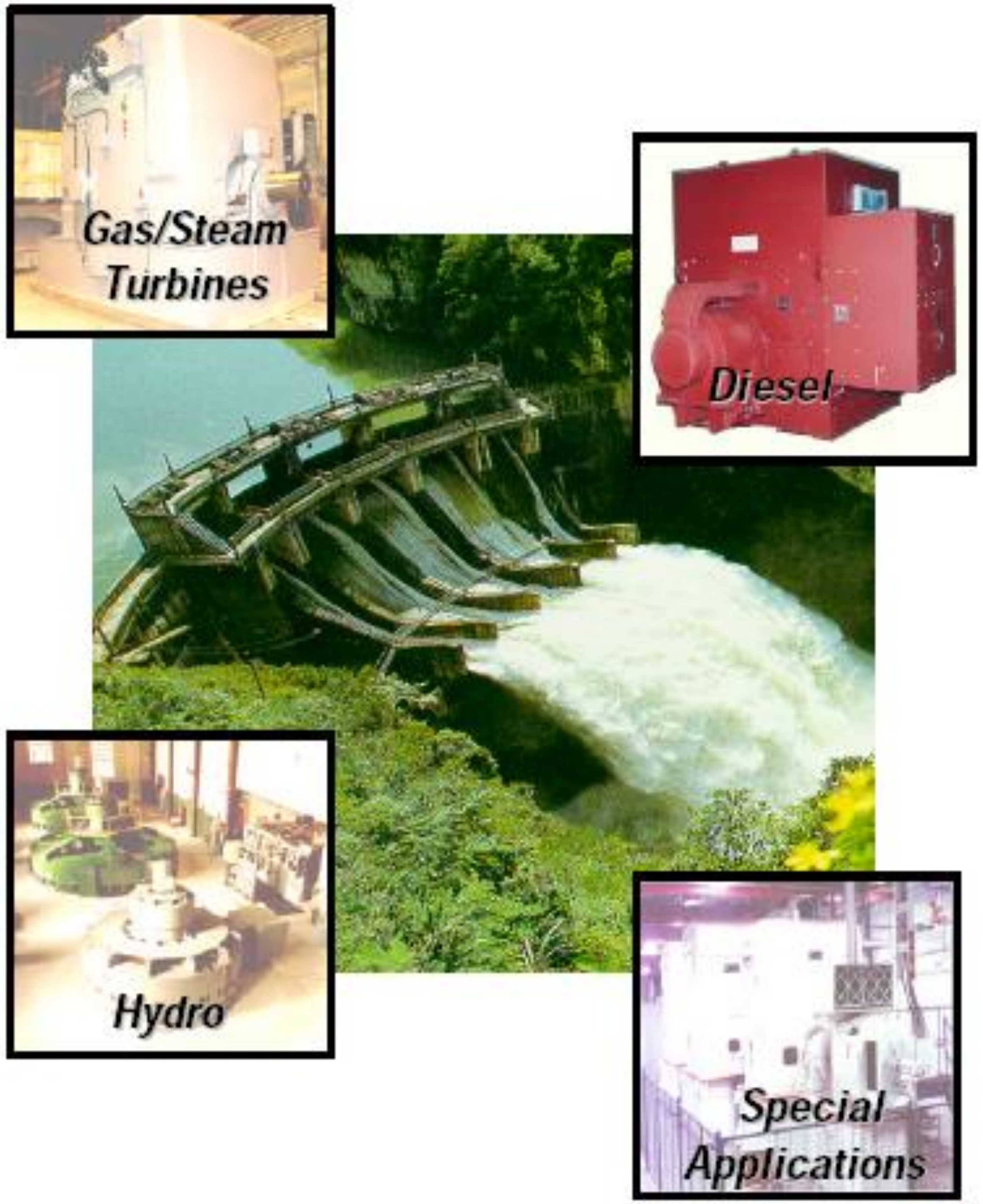
II YEAR / IV SEMESTER

Unit 1 – SYNCHRONOUS GENERATOR

Topic 10,11,12: Synchronizing torque, Change of excitation and mechanical input

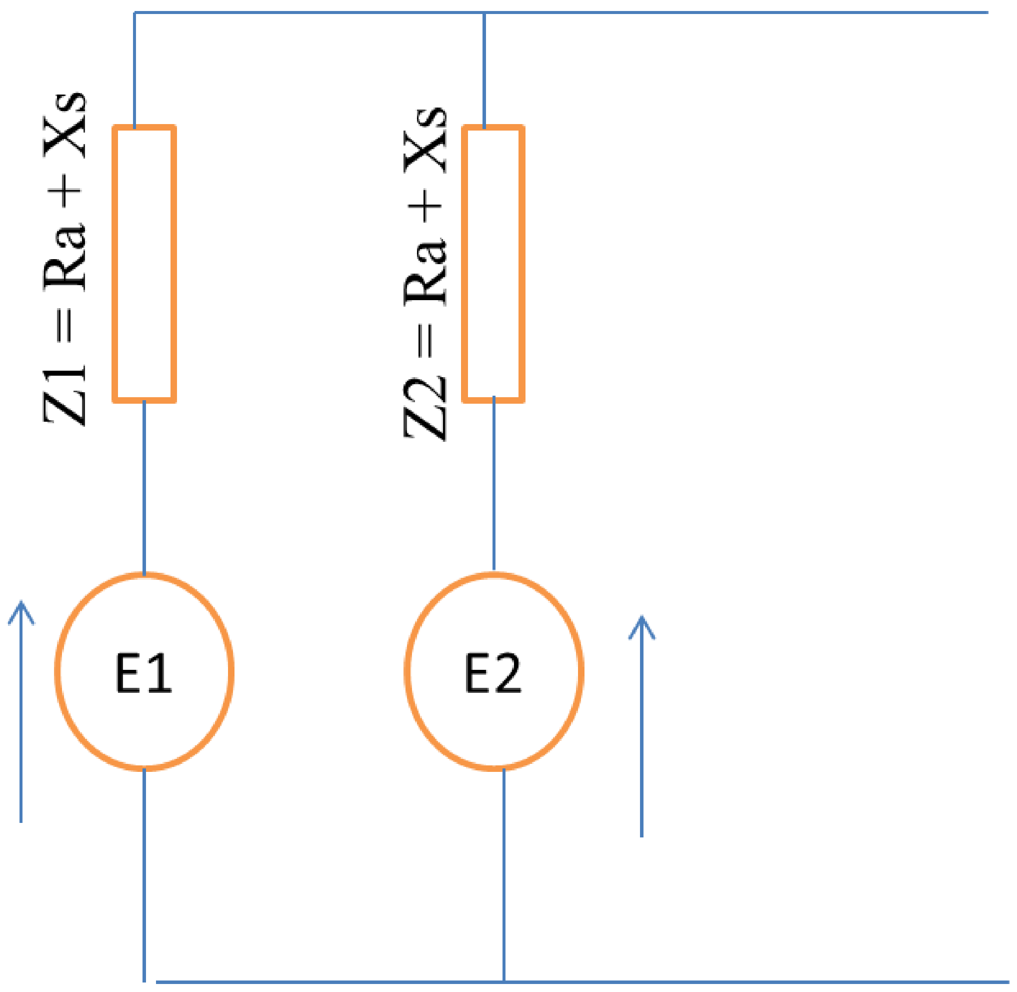
Two reaction theory

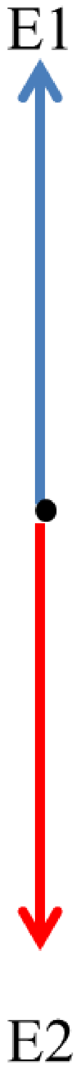
GUESS THE TOPIC NAME…

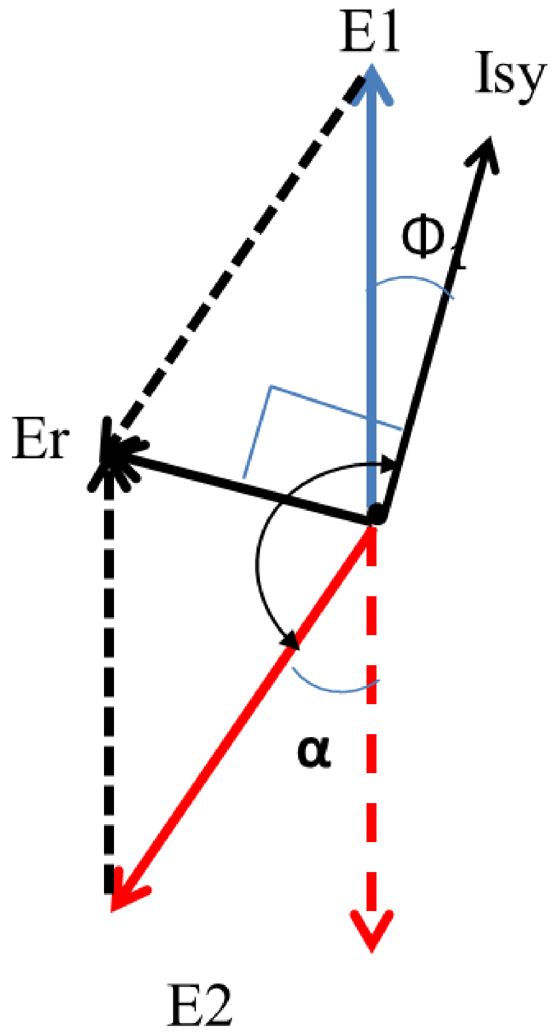


Synchronizing Current, Power and Torque

Synchronizing Current, Power and Torque







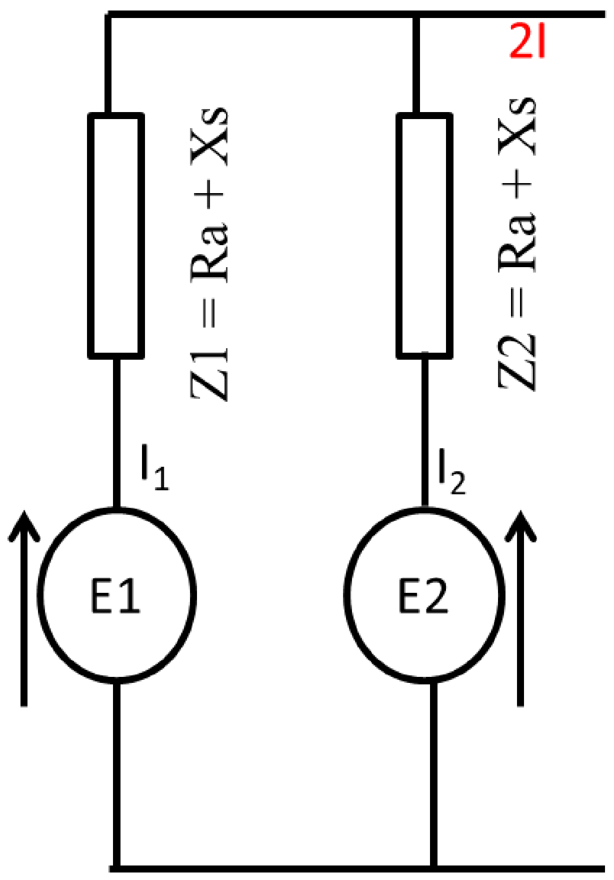
Synchronizing Current $Isy = Er / (Z1 + Z2)$

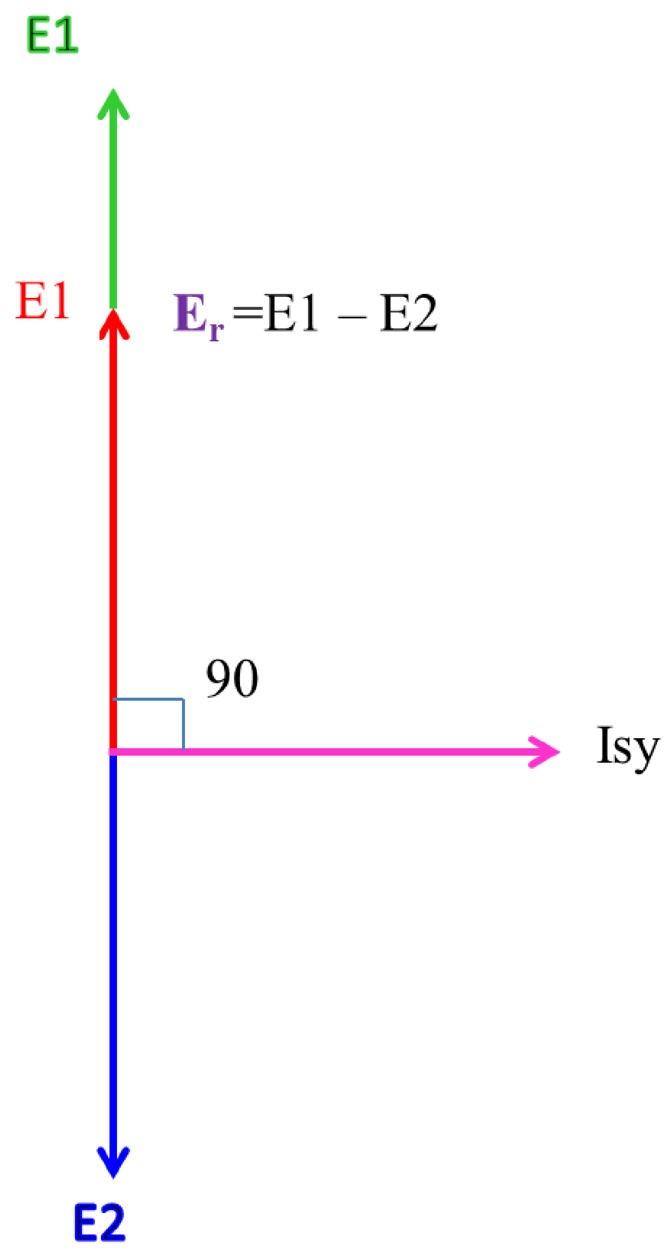
Synchronizing Power $Psy = E1 \times Isy \cos \Phi_1$

Synchronizing Torque $Tsy = Psy / (2\pi Ns / 60)$

Effect of Change in Excitation of Alternator in parallel

Effect of Change in Excitation of Alternator in parallel





NO LOAD

E1 = E2 NO local Current

Excitation of Alternator 1 Increasing

E1 also increases > E2

Resultant Er.= E1-E2

Circulating current Isy

I_{sy} lags E_r 90 Demagnetizing Effect REDUCES Eg Voltage

I_{sy} leads E_r 90 Magnetizing Effect increases Eg Voltage

Effect of Change in Excitation of Alternator in parallel

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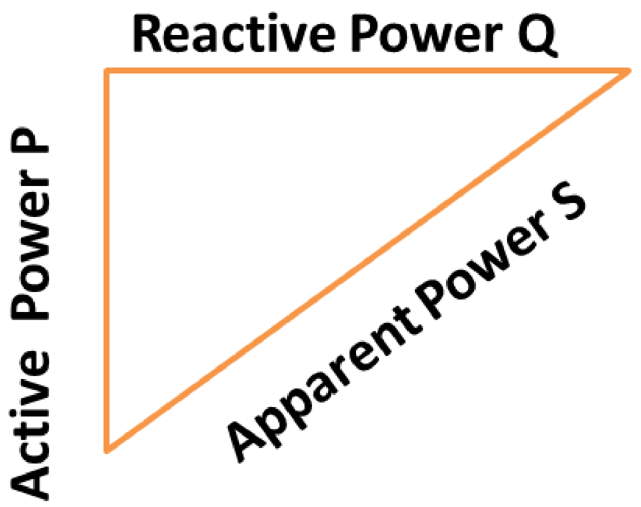
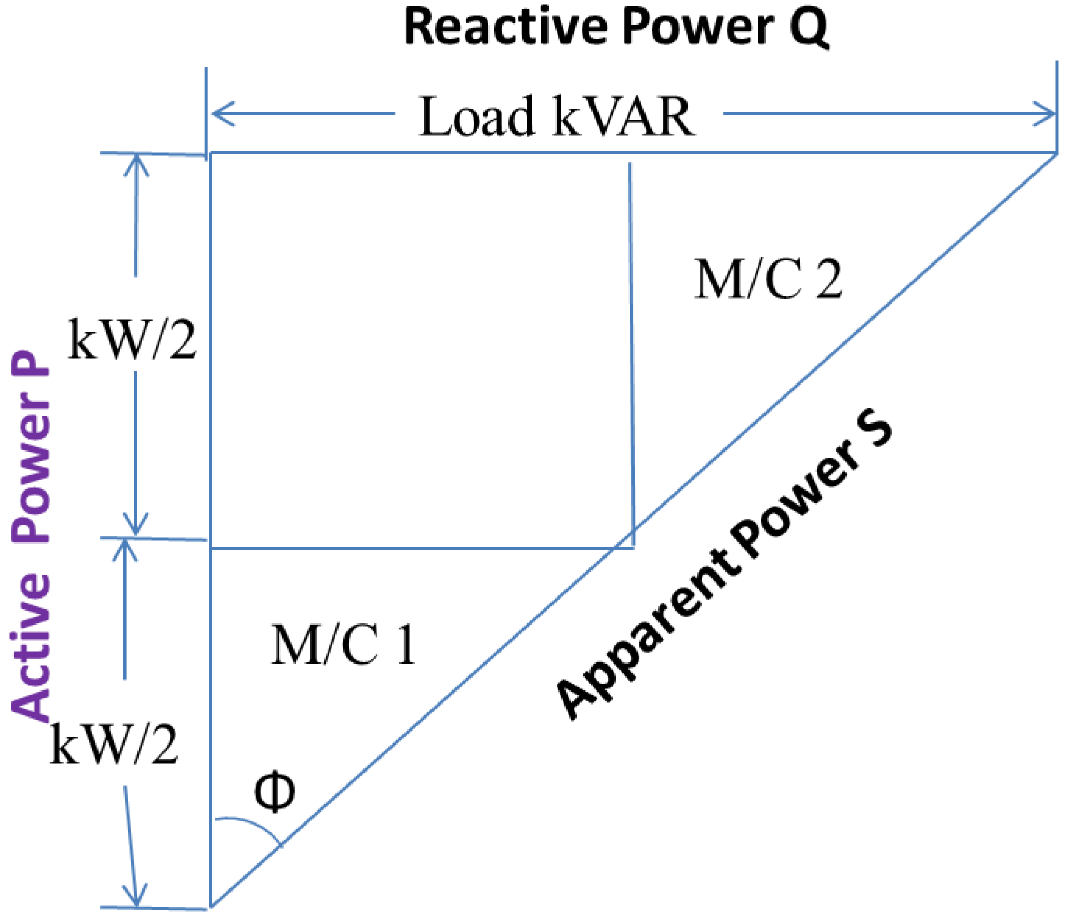
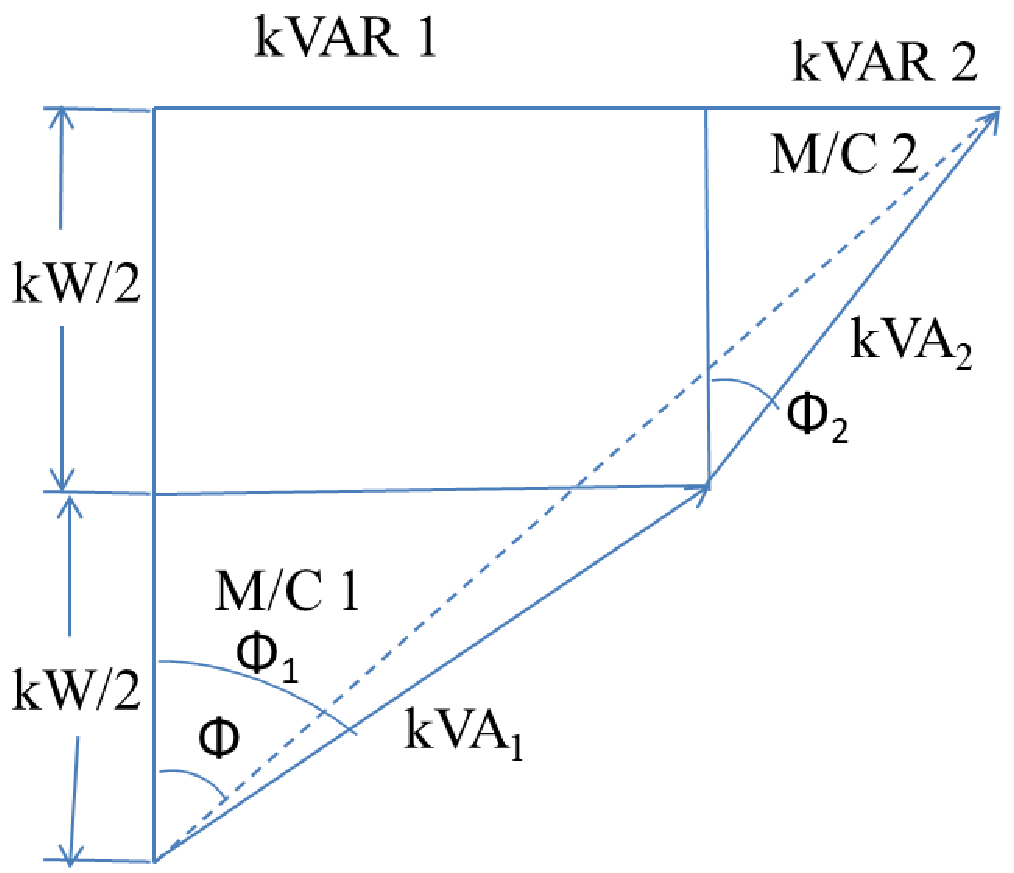


Active Power $P = \sqrt{3}V_L I_L \cos\Phi$ kW

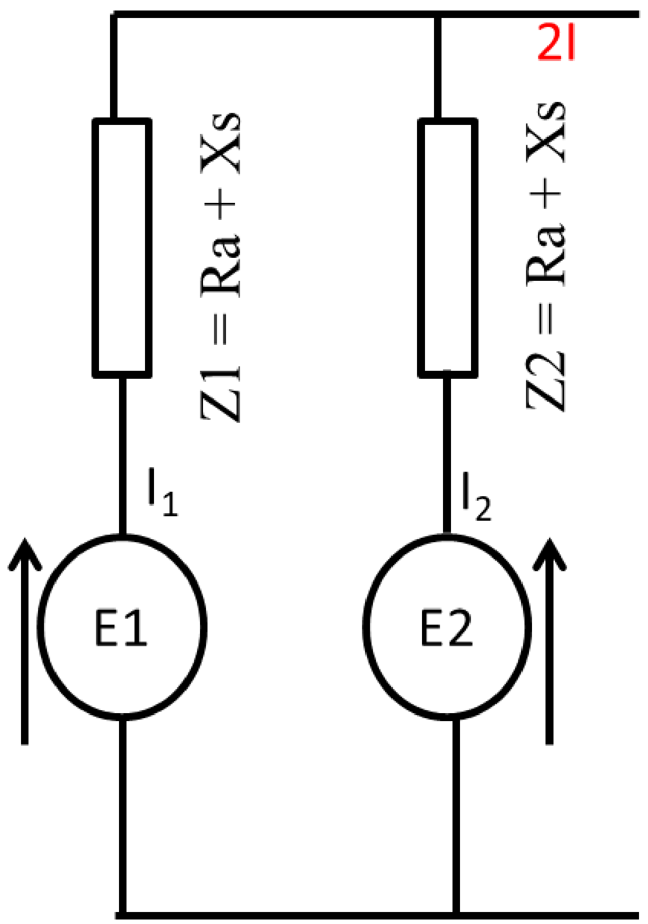
Reactive Power $Q = \sqrt{3}V_L I_L \sin\Phi$ kVAR

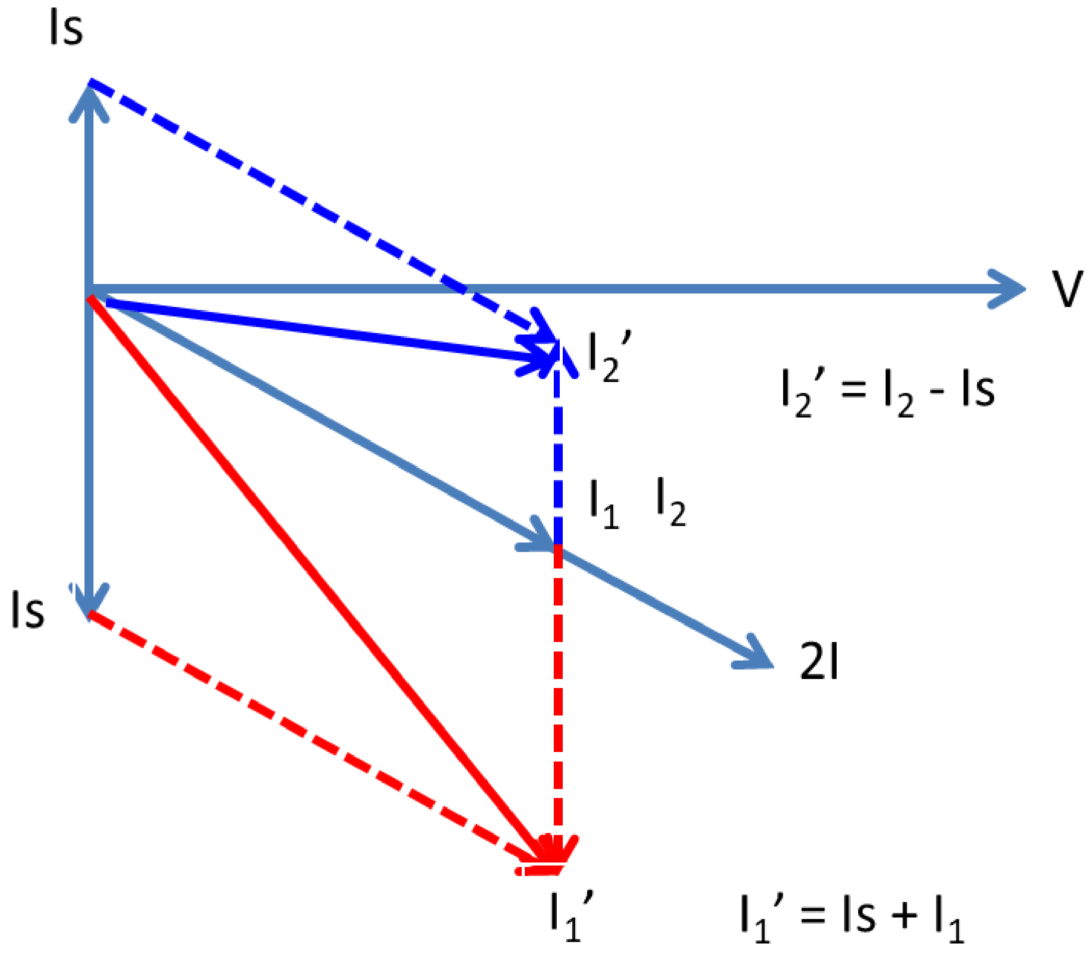
Apparent Power $S = \sqrt{3}V_L I_L$ kVA





Effect of Change in Excitation of Alternator in parallel





$I_1 = I_2 = I = 2I$

Alternator 1 field excitation

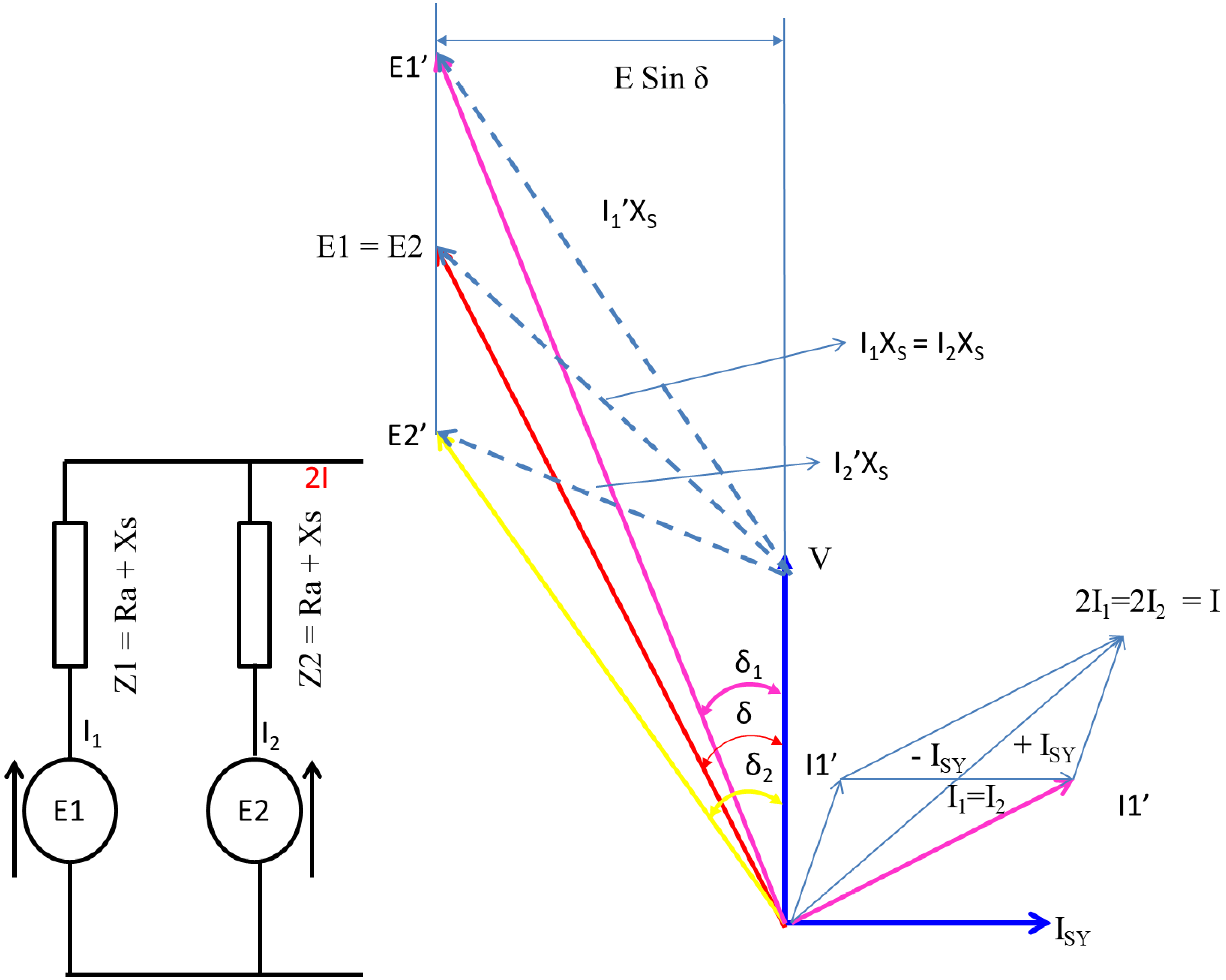
Increasing the I_F Induced voltage Increases

There is a circulating current

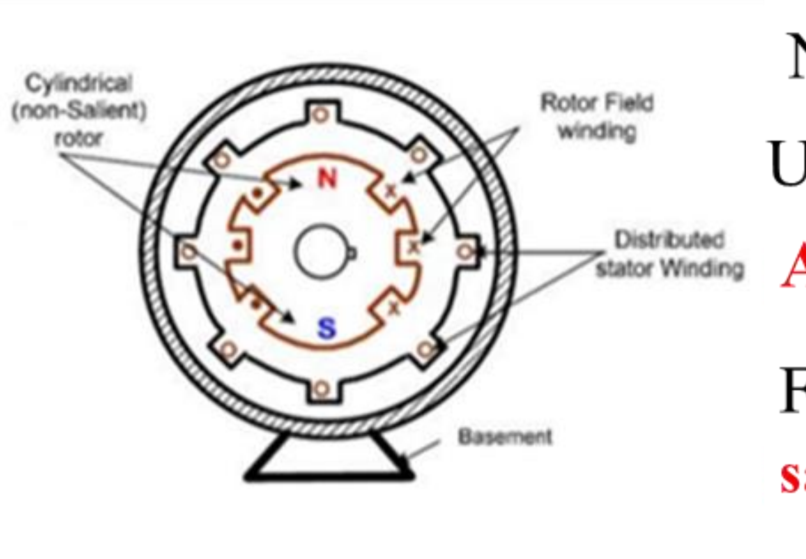
Is = (E1 - E2) / 2Z

90 Lagging V

Effect of Change in Excitation of Alternator in parallel



TWO REACTION THEORY



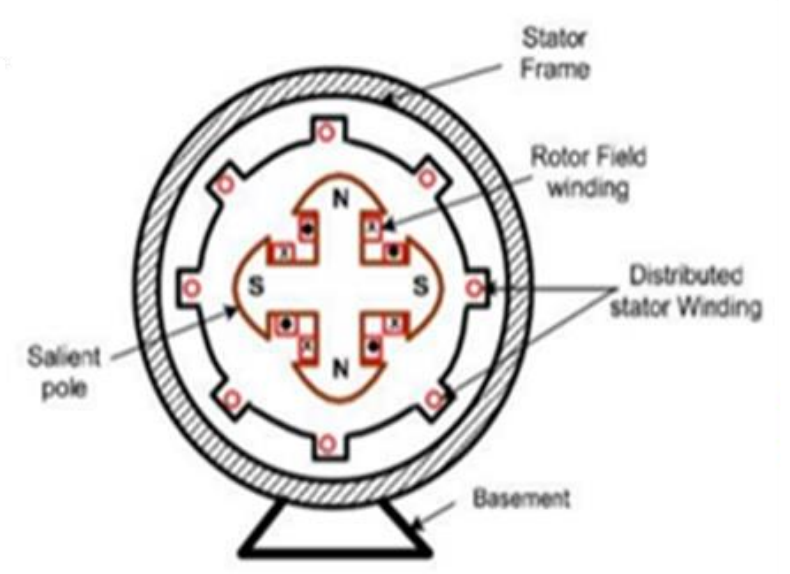
Non-Salient-Pole

Non Salient pole alternator **Air gap is uniform**

Uniform air gap **Field flux and Armature flux** vary sinusoidally

Air gap length is constant and **reactance** is also constant

Field MMF and Armature MMF act upon the **same magnetic circuit** can be added vectorially



Salient-Pole

Salient pole alternator **Air gap is NOT uniform**

Air gap length is **NOT constant** and **Reactance** is also NOT constant

Field flux and Armature flux cannot vary sinusoidally

MMF act are different

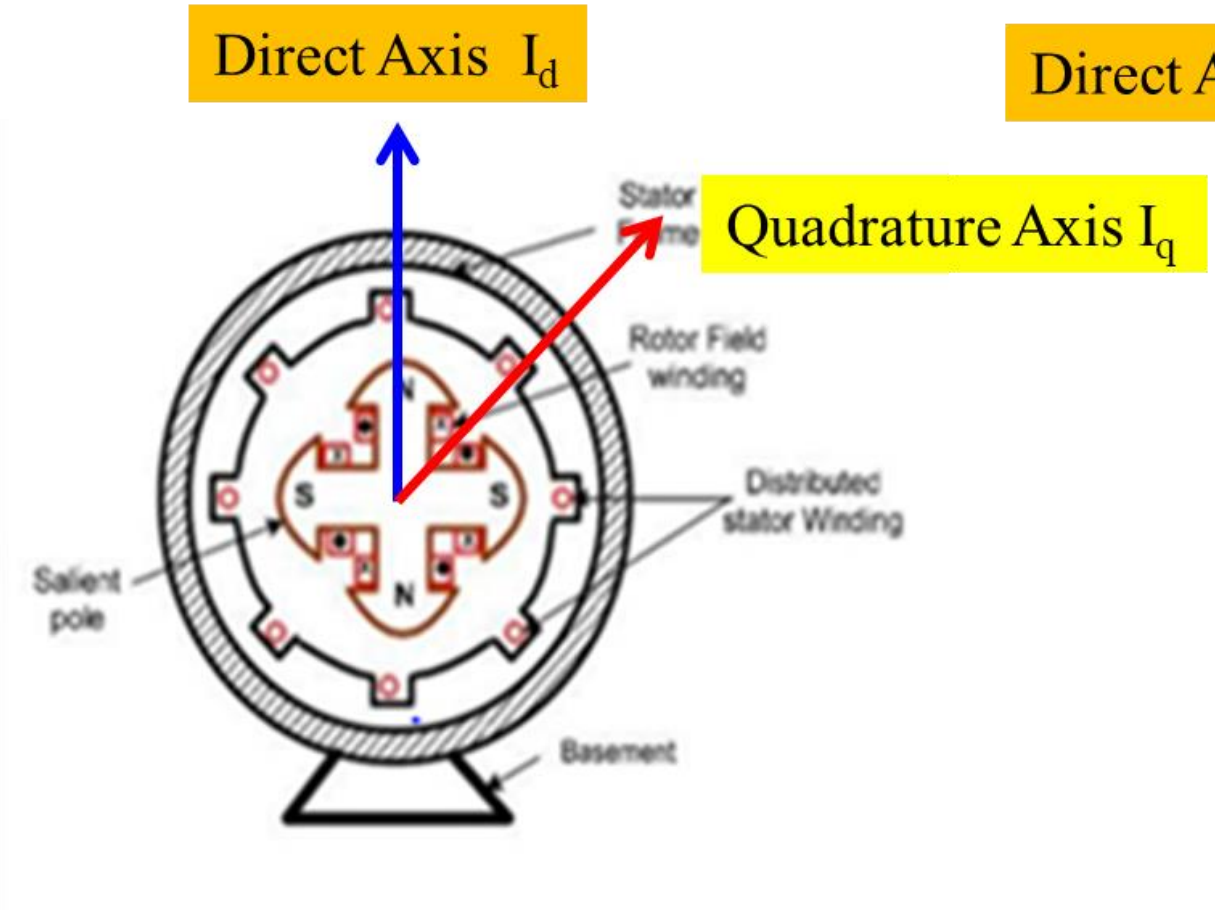
TWO REACTION THEORY

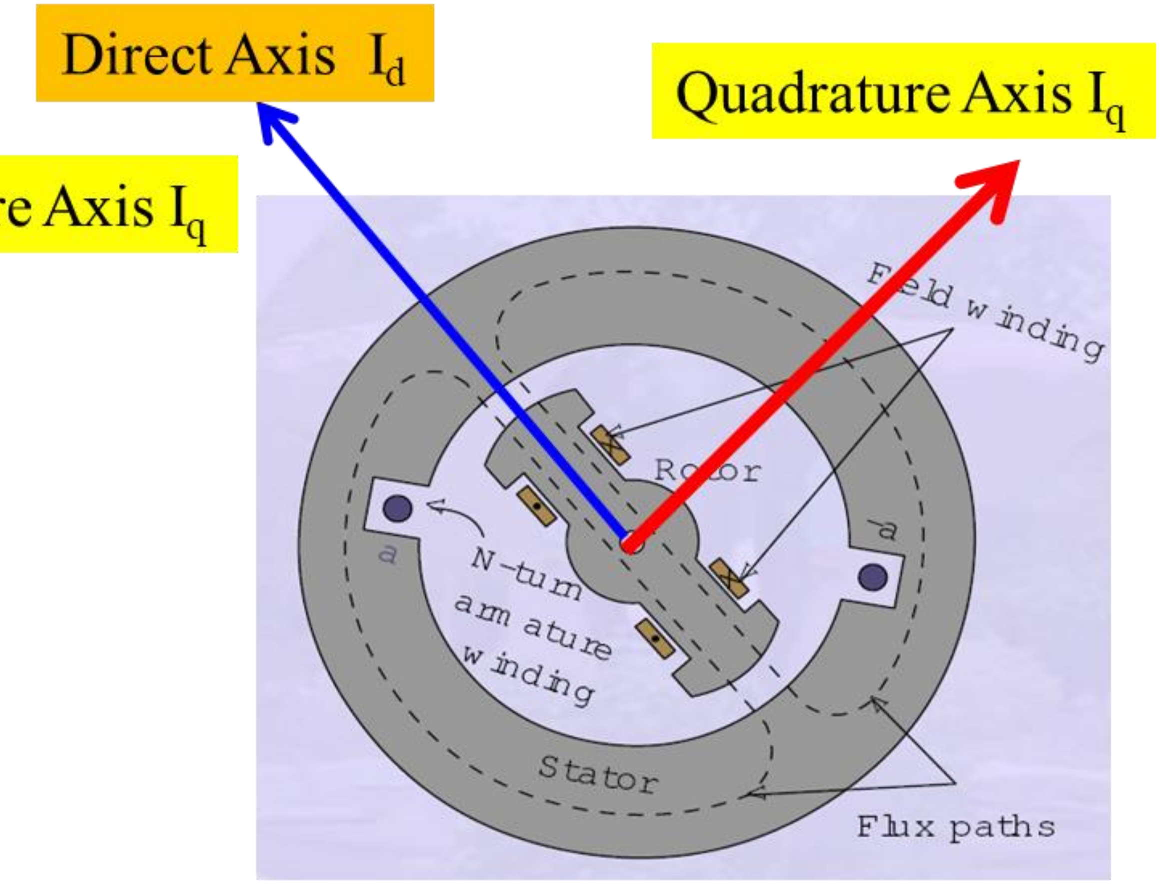
According to this theory **Armature MMF** can be divided into two components

1. Components acting along the pole axis is called Direct axis I_d
2. Components acting at right angle to the pole axis is called Quadrature axis I_q

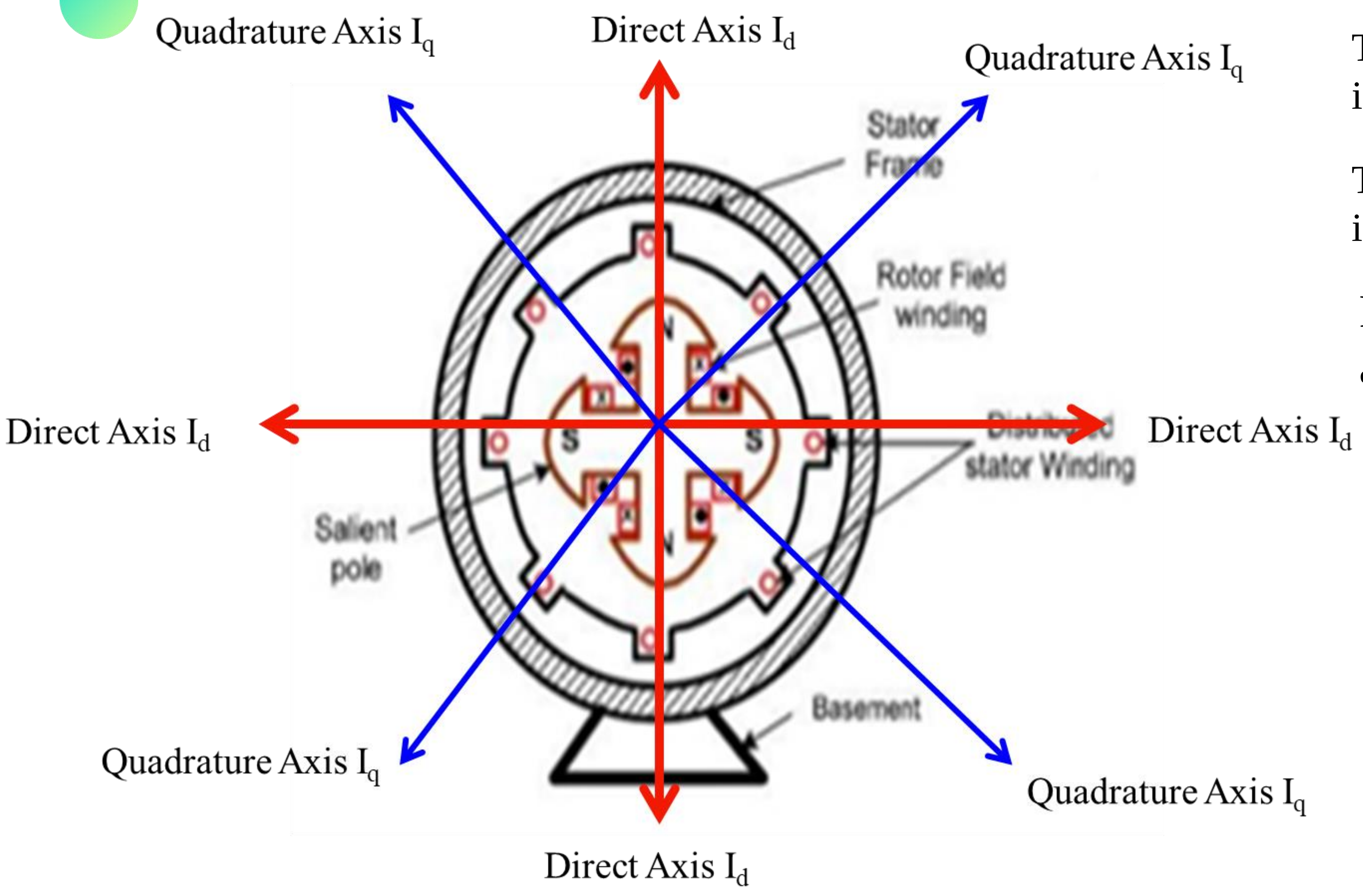
Components acting along Direct axis I_d can be **magnetizing or demagnetizing**

Components acting along Quadrature axis I_q is **Cross Magnetization**





TWO REACTION THEORY



The reluctance offered to the mmf is **lowest** when it is aligned with the field pole flux. Direct axis d-axis

The reluctance offered to the mmf is **highest** when it is 90 to the field pole flux. Quadrature axis q-axis

F_f mmf wave produced by field winding along Direct axis

SUMMARY

Synchronizing and parallel operation

KEEP LEARNING..

Thank u

SEE YOU IN NEXT CLASS