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: 23EEB210 / Electrical Machines and Drives

II YEAR / IV SEMESTER

Unit V – SOLID STATE SPEED CONTROL OF A.C DRIVES

Topic : Three phase voltage / frequency controlled AC drive

Three phase voltage / Frequency Controlled AC drive

Why Control AC Motor Speed?

- AC induction motors are workhorses but have fixed speeds based on frequency and poles.
- Many industrial and commercial applications require variable speed for efficiency, process control, and energy savings.
- Examples: pumps, fans, conveyors, HVAC systems, machine tools.

Three phase voltage / Frequency Controlled AC drive

Synchronous Speed and Slip:

- Synchronous speed (Ns) is determined by the supply frequency (f) and the number of poles (P):

  $$Ns = (120 * f) / P \{ rpm\}.$$

- Actual rotor speed (Nr) is slightly less than synchronous speed due to slip (s): $Nr = Ns (1 - s)$.
- To control Nr, we can vary either f or P.
- Changing poles is complex, making frequency control the primary method.

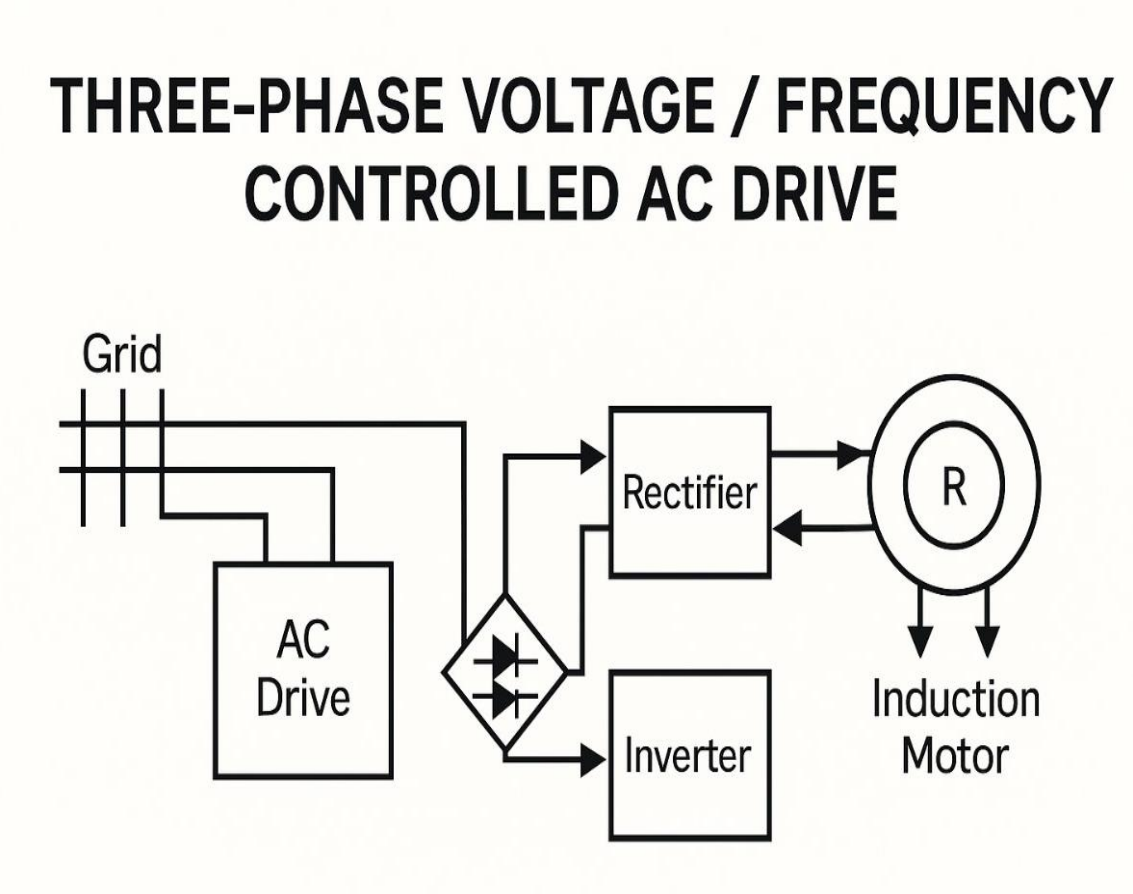
Three phase voltage / Frequency Controlled AC drive

Maintaining Constant Flux:

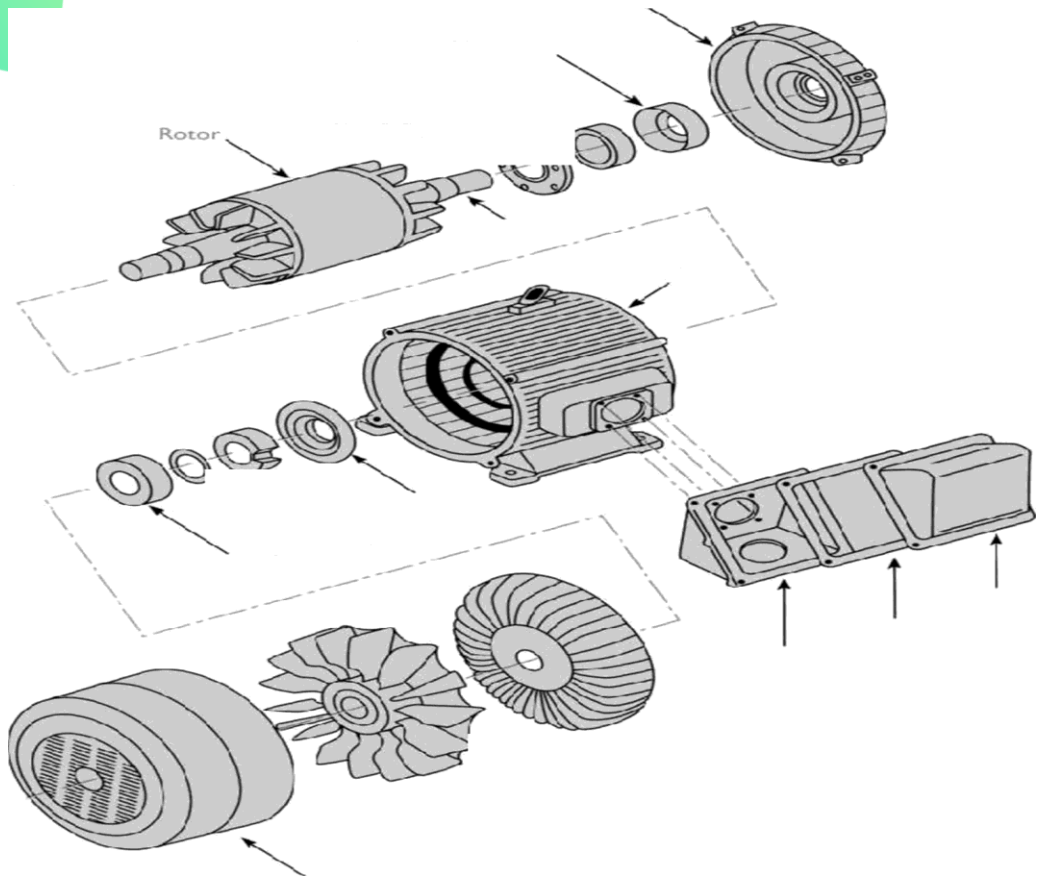
- Simply changing the frequency would also change the magnetic flux in the motor core.
- Excessive flux leads to saturation and high current.
- Insufficient flux reduces torque capability.
- V/f control maintains a constant ratio of voltage (V) to frequency (f) to ensure approximately constant magnetic flux.

  (V/f) = Constant

Three phase voltage / Frequency Controlled AC drive



Three phase voltage / Frequency Controlled AC drive



- Reliable
- Rugged
- Long lived
- Low maintenance
- Efficient

Three phase voltage / Frequency Controlled AC drive

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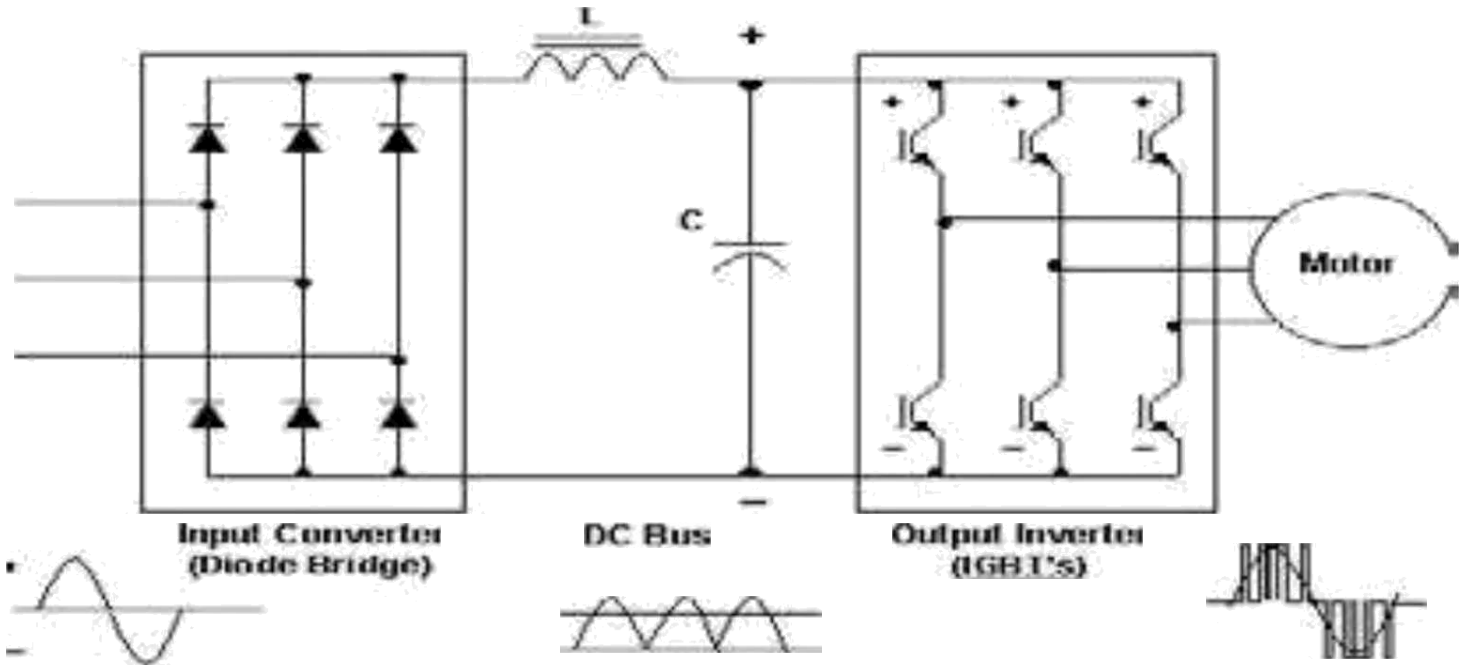
Three phase voltage / Frequency Controlled AC drive

AC DRIVE


L
+
C
Motor
Input Converter
(Diode Bridge)
DC Bus
Output Inverter
(IGBT's)

Three phase voltage / Frequency Controlled AC drive

KEEP
LEARNING.

Thank u

SEE YOU IN NEXT CLASS