SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EEB210 / Electrical Machines and Drives

II YEAR / IV SEMESTER

Unit IV – SOLID STATE SPEED CONTROL OF DC DRIVES
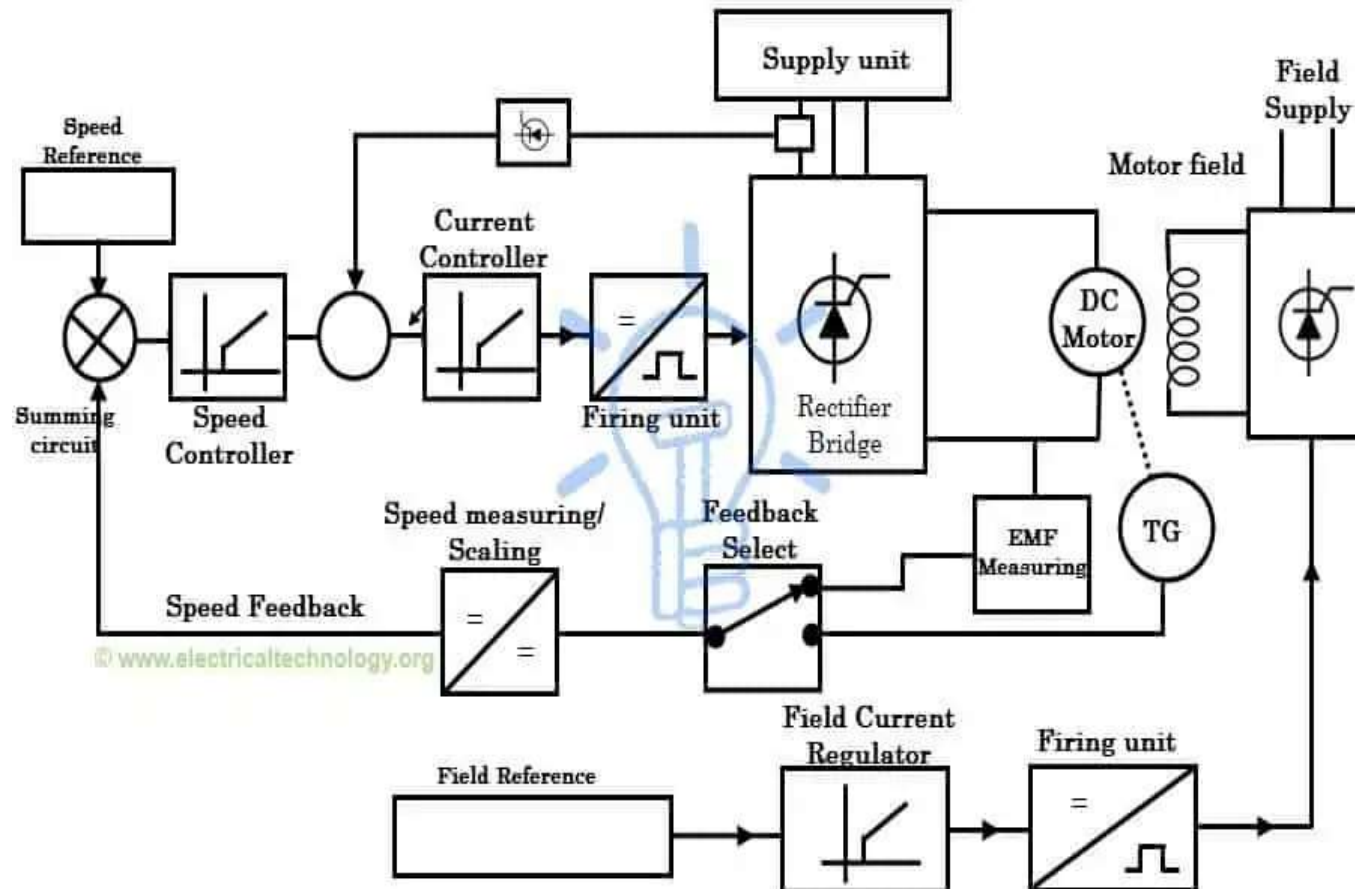
Topic : Digital control DC motor drive

Digital control DC motor drive

- The advancements in digital control, DC drives become more flexible and faster (due to faster response times) compared with analog drives.

- A schematic arrangement of digital DC drive is shown in below figure.

- It is similar to the analog scheme, but here analog circuit (analog amplifiers) is replaced by digital circuitry.

Digital control DC motor drive

DIGITAL DC DRIVE BLOCK DIAGRAM

Digital control DC motor drive

A speed reference signal given as the drive's input compared with the feedback speed in the summing circuit. If the output of the summing circuit is positive error, indicating that a speed increase is required and if it generates a negative error, indicating that a speed decrease is required (because motor is operating at faster than desired speed).

The error speed is given to the speed controller in the microprocessor which determines output voltage to operate the motor at desired speed. At the same time, current controller in the microprocessor determines the firing signals to the SCRs in the bridge converter. SCRs then convert the three phase supply to DC supply in relation to the desired speed.

Digital control DC motor drive

This drive can operate in open loop without any feedback and can achieve a speed regulation of 5-8%. However, a speed regulation less than 5% is required in many applications. In such cases, the speed measuring/scaling unit switches to the EMF feedback measuring circuit.

This feedback circuit measures the armature voltage, scales it in proportion to the output voltage (scaling function in microprocessor) and gives to the summing circuit. Further, it is transformed into a speed error signal in speed controller.

If the speed regulation less than 1% is required, tachometer generator feedback is used. So the speed measuring/scaling circuit then switches to the tachometer feedback. This feedback achieves very precise control compared with EMF feedback.

Digital control DC motor drive

Also for field control (above rated speeds), this drive includes a separate field exciter. A field current regulator in the microprocessor determines the voltage to the field windings by accepting the flux/field reference signal from the operator. This regulator provides the firing signals required by the field converter unit to produce the required DC voltage proportional to the speed.

KEEP
LEARNING.

Thank u

SEE YOU IN NEXT CLASS