

4.3 MARGINAL ANGLE CONTROL

The operation of the inverter at the minimum safe value of the margin angle gives the highest power factor and the maximum torque per ampere of the armature current, thus allowing the most efficient use of both the inverter and motor.

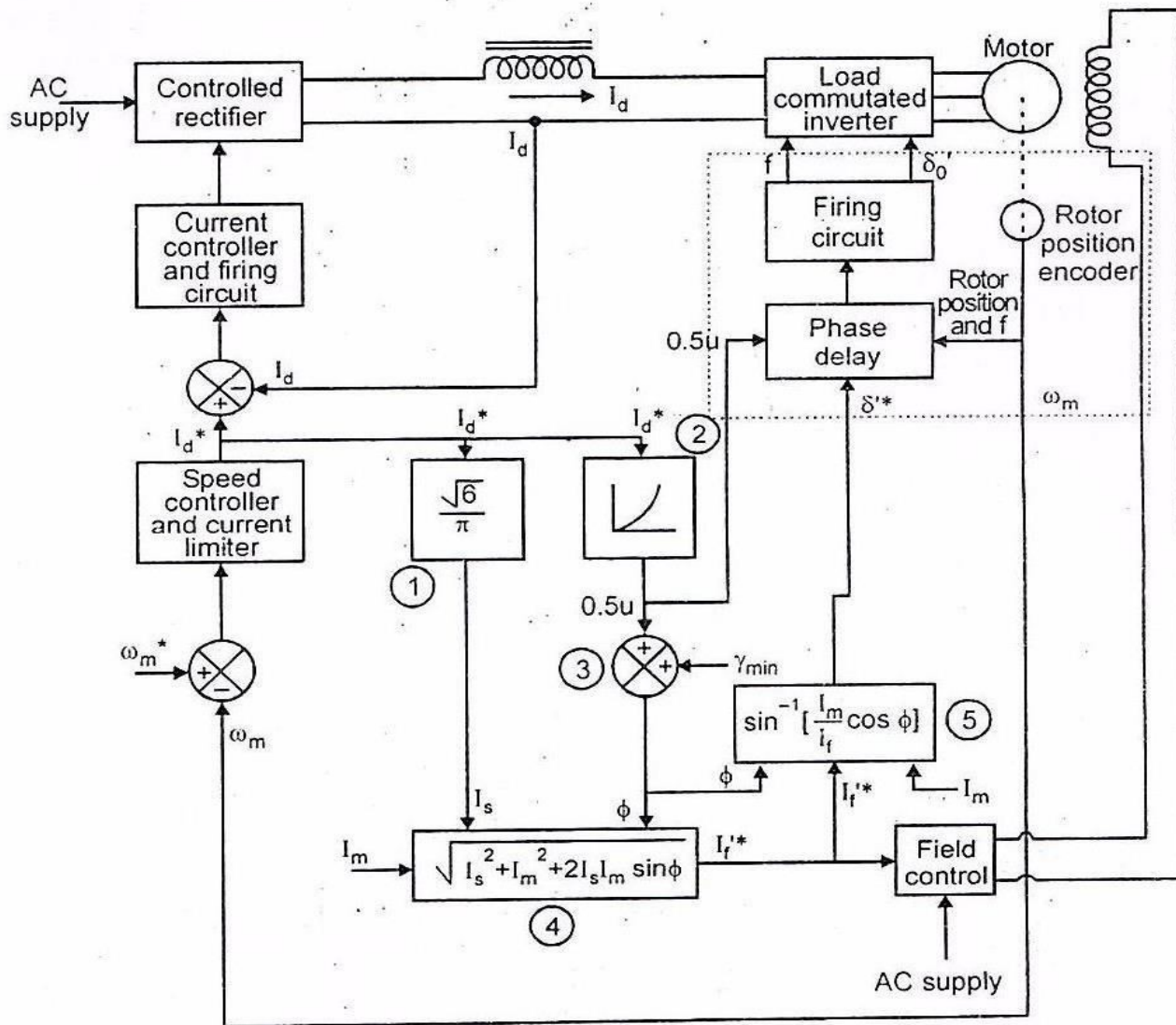


Figure 4.3.1 Constant Marginal Angle Control

(Source: "Fundamentals of Electrical Drives" by G.K. Dubey, page-270)

Fig shows the constant margin angle control for a wound field motor drive employing a rotor position encoder. This drive has an outer speed loop and an inner current loop. The rotor position can be sensed by using rotor position encoder. It gives the actual value of speed ω_m . This signal is fed to the comparator. This comparator compares ω_m and ω_m^* (ref value).

The output of the comparator is fed to the speed controller and current limiter. It gives the reference current value I_d^* . I_d is the DC link current. It is sensed by current sensor and fed to the comparator. The comparator compares I_d and I_d^* . The output of the comparator is fed to the current controller. It generates the trigger pulses.

It is fed to the controlled rectifier circuit. In addition, it has an arrangement to produce constant flux operation and constant margin angle control. From the value of dc link current command I_d^* , I_s and $0.5u$ are produced by blocks (1) and (2) respectively. The signal ϕ is generated from D_{min} and $0.5u$ in adder (3).

In block (4) I_f is calculated from the known values of I_s , ϕ and I_m . Note that the magnetizing current I_m is held constant at its rated value I_m to keep the flux constant.

I_f^* sets reference for the closed loop control of the field current I_f . Blocks (5) calculates I_f^* from known values of ϕ and I_f^*

The phase delay circuit suitably shifts the pulses produced by the encoder to produce the desired value of θ . This signal is fed to the load commutated inverter.

The load commutated inverter drives are used in medium power, high-power and very high power drives, and high speed drives such as compressors, extractors, induced and forced draft fans, blowers, conveyers, aircraft test facilities, steel rolling mills, large ship propulsion, main line traction, flywheel energy storage and so on.

This drive also used for the starting of large synchronous machines in gas turbine and pumped storage plant.

High power drives employ rectifiers with higher pulse numbers, to reduce torque pulsations. The converter voltage ratings are also high so that efficient high voltage motors can be employed.

