

Induction Motor Slip

Electrical Engineering

Synchronous speed, slip, and why the rotor can never quite catch up.

An induction motor must run below synchronous speed, or it develops no torque at all.

$$n_s = 120f/p \cdot s = (n_s - n)/n_s$$

4 poles at 50 Hz

$$120 \times 50 \div 4.$$

$n_s = 1500$ rpm

Running at 1440 rpm

$$60 \div 1500.$$

Slip is 4%

Rotor frequency

$$\text{Slip} \times \text{supply}.$$

2 Hz

THE COMMON MISTAKE

✗ **Expecting rated torque at synchronous speed**

✓ **Torque near rated load rises with slip**

At synchronous speed the rotor sees no changing flux, so no rotor current is induced and there is nothing to produce torque.

Educational reference. Direct-on-line starting current can reach six times rated; motor circuits are governed by local electrical regulations.