

Synchronous Machines

Electrical Engineering

The machine that sets grid frequency, and what its excitation actually controls.

A synchronous machine runs exactly at supply frequency, its rotor field locked to the stator field.

TWO POLES AT 50 HZ
3000 rpm

FOUR POLES AT 50 HZ
1500 rpm

PULL-OUT LOAD ANGLE
Near 90 degrees

- Speed is fixed by frequency and pole count
- Excitation sets reactive power, not real power
- Over-excited, the machine supplies reactive power
- Under-excited, it absorbs reactive power instead
- Load angle sets the real power transferred
- It cannot start unaided from standstill

LOOK FOR IT

A synchronous condenser is an unloaded machine run purely to trim the network's power factor.

Educational reference. Nearly every large grid generator is a synchronous machine, and grid work requires qualified supervision.