

# LECTURE 3

## Vector Diagram

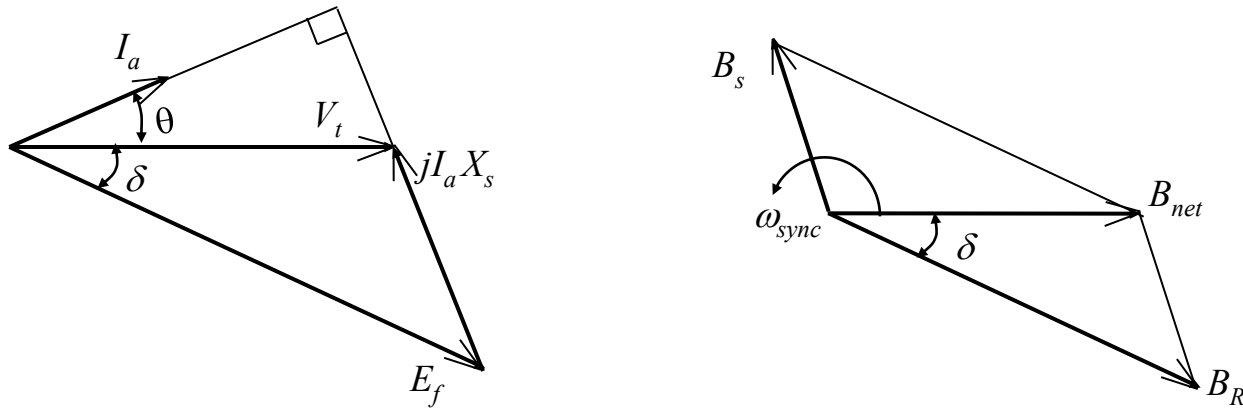


Fig. The phasor diagram (leading PF: overexcited and  $|V_t| < |E_f|$ ) and the corresponding magnetic field diagram of a synchronous motor.

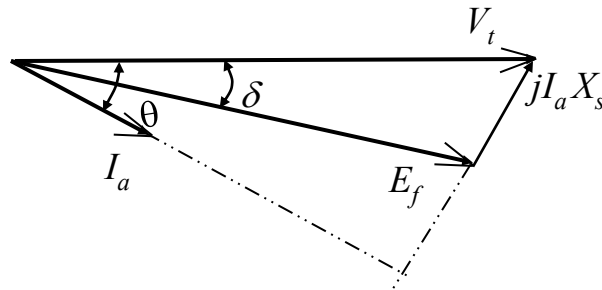


Fig. The phasor diagram of an underexcited synchronous motor (lagging PF and  $|V_t| > |E_f|$ ).

## Application of Synchronous Motors

Synchronous motors are usually used in large sizes because in small sizes they are costlier as compared with induction machines. The principal advantages of using synchronous machine are as follows:

- Power factor of synchronous machine can be controlled very easily by controlling the field current.
- It has very high operating efficiency and constant speed.
- For operating speed less than about 500 rpm and for high-power requirements (above 600KW) synchronous motor is cheaper than induction motor.

In view of these advantages, synchronous motors are preferred for driving the loads requiring high power at low speed; e.g; reciprocating pumps and compressor, crushers, rolling mills, pulp grinders etc.