HUNTING.

- The oscillations of the rotor of a synchronous machine, about its equilibrium position is known as **hunting**.

- Under normal running condition, the relative velocity between the stator and rotor field is zero, as both are rotating in the same direction with N_s.

- This normal running condition may be disturbed by a **sudden change of load** or **a sudden change in field current** or **a fault in the supply system**.

- This sudden disturbance causes the load angle δ, to change. Before the rotor can settle to this new load angle, δ_{new}, it undergoes oscillations about this new equilibrium position due to its inertia. These oscillations are known as hunting.

- This phenomena involving oscillations of the rotor, is known as hunting, because the rotor has to "Search for" or "hunt for", its new equilibrium position after sudden disturbance.

- Hunting is also known as **phase swing**. (details of which are there in Power System Stability, under topic - swing equation, in next year course).

→ **Causes of hunting.**

ⓐ Sudden change of **load** – electrical or mechanical.
ⓑ Sudden change in **field current**.
ⓒ. **fault** in supply system.

→ **Effects of hunting**

ⓐ It may lead to **loss of synchronism** of the machine.
ⓑ It causes **large mechanical stress** on the shaft.
ⓒ. It causes **increased power consumption.**
ⓓ. It may lead to **temperature rise** of the machine.

→ **Methods of Reducing Hunting.**

ⓐ **Using Damper windings:-**

- Providing damper windings in pole face helps in reducing oscillations.
- Whenever there is osciallation in rotor, the speed of rotor is different from synchronous speed. This causes a relative speed between damper winding and stator field, causing an induced emf in the damper windings.
- By lenz's law, the current in damper winding opposes the cause, i.e. osciallation.

ⓑ **Using flywheel**

- Providing heavy flywheel increases inertia of rotor, thereby reducing osciallations.

© By having suitable stiffness coefficient of machine

- Stiffness coefficient has tendency to prevent machine from losing synchronism. So, when there are oscillations, suitable value of stiffness coefficient tries to prevent it.

Uses of Damper winding.

- From above discussions, we can conclude that damper winding has two main application in case of synchronous motors.
  (i) For starting synchronous motors.
  (ii) For reducing effect of hunting.

(Details of both these uses have already been covered)

Synchronous Condenser.

- A synchronous motor operating without any mechanical load, for improvement of power factor of the system, is known as synchronous condenser.

- It is also known as, synchronous capacitor or synchronous phase modifier. or synchronous VAR compensator.

- We know that by changing the field current of a synchronous motor, it can be made to operate at different power factors.

– So, by changing the field current, we can make the synchronous motor to take or deliver reactive power.

⇓

When we keep excitation current low, then $E_f \cos\delta < V_t$ (Under-excited condition). and motor takes reactive power.

When we keep excitation current high, then $E_f \cos\delta > V_t$ (Over-excited condition), and motor delivers reactive power.

⇓

So, this feature of synchronous motor is used in synchronous condenser. Its main purpose is to improve power factor of system. It is a synchronous motor, made to work on no-load, with variable excitation, to take or deliver reactive power.

Advantages of synchronous condensers:-

(i) Easy control of reactive power requirements of the power system.

Disadvantages.

(i) Losses are high, as compared to other methods of p.f. improvement.
(ii) Maintenance cost is high.
(iii) Auxiliary equipment is needed for starting.