UNIT-V

VOLTAGE CONTROL

Power circle diagram and its use

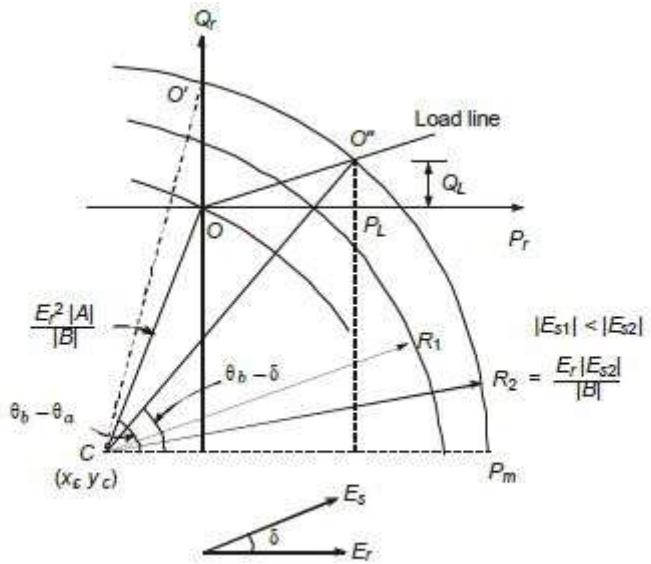

Fig. 5.17 Receiving-end circle diagram for calculating reactive compensation for voltage control at buses.

Voltage control using synchronous condensers

- From the generalized constants (*A*, *B*, *C*, *D*) of a given input port and output port, the powercircle diagram or the corresponding geometrical relations can be utilized for deciding the proper compensating MVAR's to be provided at the receiving end when a set of magnitudes for *Er* and *Es* at the two ends of the line are specified.

Cascade connection of shunt and series compensation

- In the previous sections, the (*A*, *B*, *C*, *D*) constants of only the line were considered. It becomes evident that through the example of the 750 kV line parameters, it is impossible to control the voltages within limits specified by IS and IEC by providing compensation at one end only by synchronous condensers, or by switched capacitors if the voltages are to vary over wider limits than discussed. In practice, shunt-compensating reactors are provided for no-load conditions which are controlled by the line-charging current entirely, and by switched capacitors for fullload conditions when the load has a lagging power factor.

Sub synchronous resonance in series capacitor and Compensated lines

- ***Natural Frequency and Short-Circuit Current***
- The resonance frequency occurs when *XL (fe)= Xc (fe)* giving
- We can introduce the power frequency *f*0 by re-writing equation

Static VAR compensating system and solving problems

- 1. When used at intermediate buses on long lines, the steady-state power-handling capacity is improved.
- 2. Transient stability is improved.
- 3. Due to increased damping provided, dynamic system stability is improved.
- 4. Steady-state and temporary voltages can be controlled.
- 5. Load power factor can be improved thereby increasing efficiency of transmission and
- lowering of line losses.
- 6. Damping is provided for SSR oscillations.