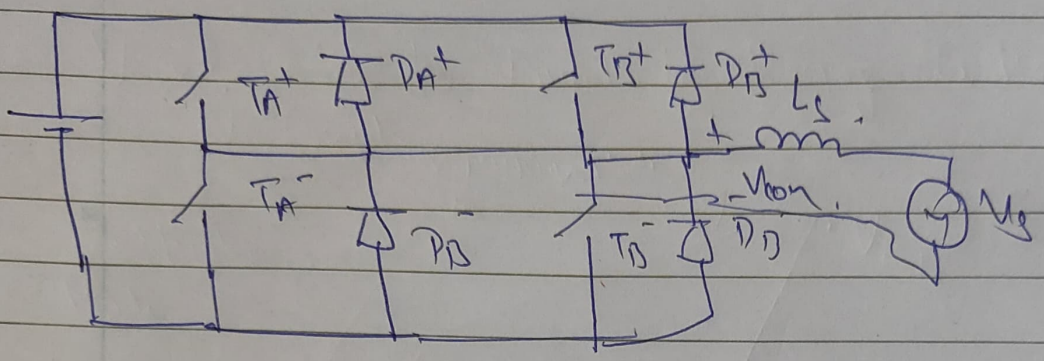
1-φ full bridge ~~rectifier~~ inverter Connected to D.M.



V_s ⇒ represent back emf of 1-φ D.M.

$$V_{con} = V_{Ls} + V_s$$

$$V_{Ls} = L_s \frac{di_s}{dt}$$

fundamental Component of Converter 1,

$$V_{conv1} = V_{Ls1} + V_s$$

~~Direction of~~

Back emf, $V_s = V_{con1} - V_{Ls1}$

$$= V_{con1} - j\omega L_s I_{s1}$$

Direction of i_{s1} ⇒ decides the direction of inverter & rectification

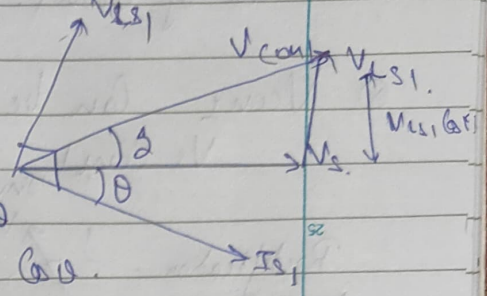
Modes of operation

Inversion Mode.

V_s remain Const. for Small interval.

I_{s1} is laggig V_s by angle θ.

V_{con1} leads V_s by an angle δ.



Real power at AC Side is $= P = V_s I_{s1} \cos\theta$

$$= V_s * \frac{V_{ls1}}{\omega L_{s1}} \cos\theta.$$

$V_{ls1}\cos\theta \simeq V_{con1}\sin\delta.$

$$\boxed{P = \frac{V_s}{\omega L_{s1}} V_{con1}\sin\delta = \frac{V_s^2}{\omega L_{s1}} \cdot \frac{V_{con1}}{V_s}\sin\delta.}$$

Power flows from dc Side to AC Side $\Rightarrow$ Inversion Mode

Reactive Power $Q = V_s I_{s1} \sin(180+\theta)$.

$$= -V_s I_{s1}\sin\theta$$

$$= -V_s \frac{V_{ls1}}{\omega L_{s1}} \sin\theta.$$

$V_{ls1}\sin\theta \simeq (V_s - V_{con1}\cos\delta)$

$$\boxed{Q = \frac{V_s^2}{\omega L_s}\left[\frac{V_{con1}}{V_s}\cos\delta - 1\right]}$$

$\Rightarrow$ 'Q' is Sum of reactive Power absorbed by Converter & inductor L.

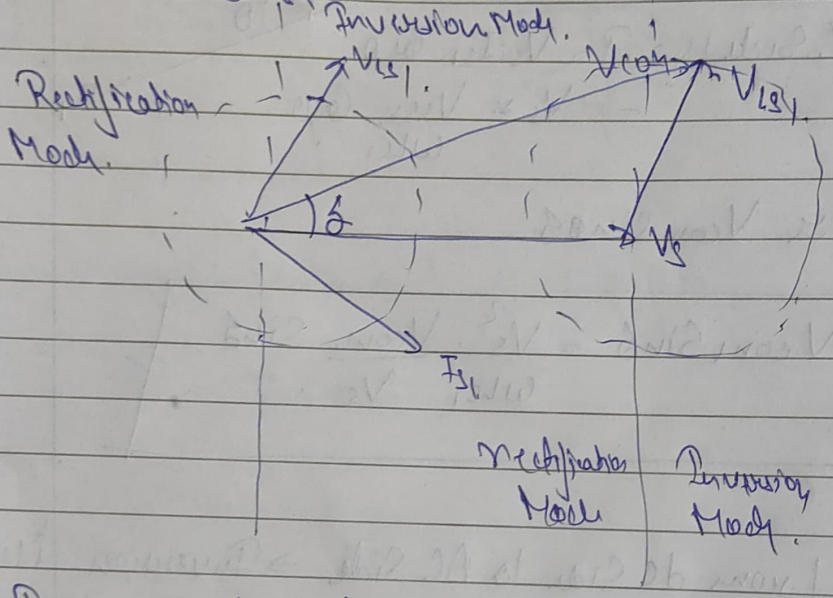
$\Rightarrow$ At very high Switching frequency L_s Can be made very Small.

$\Rightarrow$ Then Q is the reactive Power absorbed by the Converter.

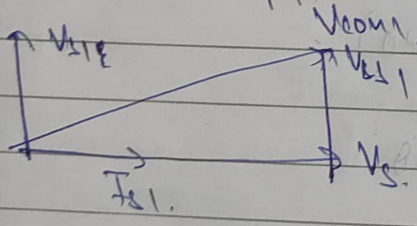
Date :

⊛ For a given Value of AC Side Side Potential (Back emf) V_s and the Choosen Value of inductance i.e. desired Value of PF Q can be obtained by Controlling magnitude & phase angle δ of V_{con1}.

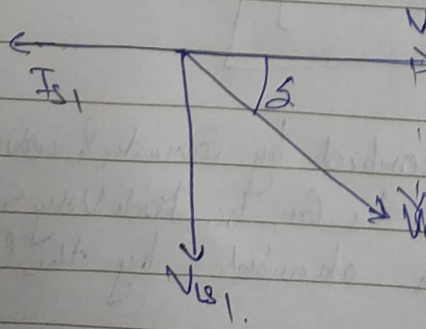
⊛ V_{con1} Can be Varied by keeping the Magnitude of I_{s1} & V_s Const.



⊛ Inversion at Upf.



⊛ Rectification at UPF



∴ In both Cases $V_{con1} = \sqrt{V_s^2 + (\omega L_s I_{s1})^2}$.