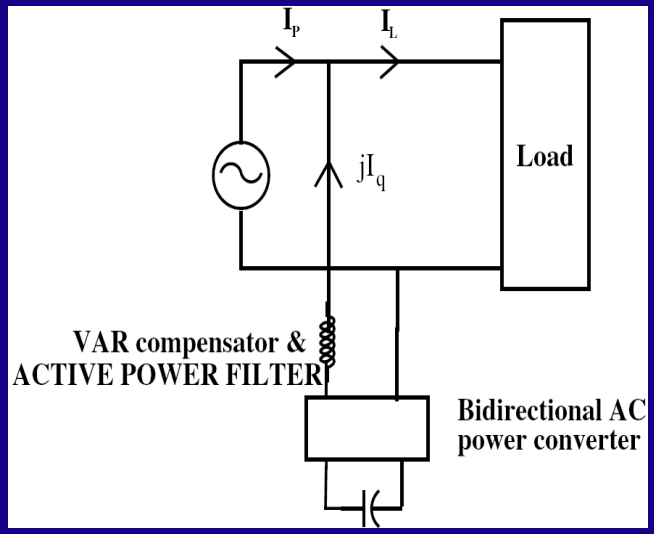
Review :

1) Self commutating devices should be used in V.S.I. feeding lagging P.F.
2) If the P.F. is leading, S.C.R's can be used as switching elements
3) If V.S.I is feeding a pure 'L' load, input batteries can be replaced by 'C'
4) Under non-ideal condition, even if inverter is fully loaded by pure 'L' load, Input power $\approx$ 0



3 – Φ Inverter :

Required Output : 3 - Φ AC

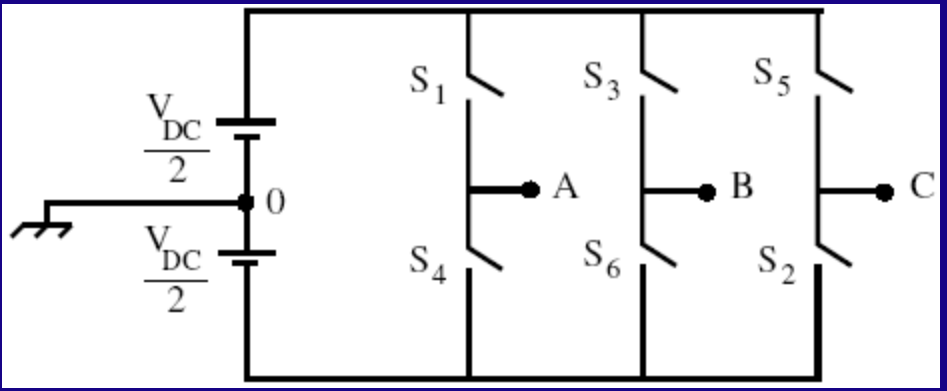
Phase Displacement between S_1 & S_3 = 120°

S_1 ON $V_{A0} = \frac{V_{DC}}{2}$

OFF $= \frac{-V_{DC}}{2}$

$V_{AB} = V_{A0} - V_{B0}$

0 to $\frac{2\pi}{3}$



$V_{A0} = \frac{V_{DC}}{2}$ $V_{B0} = \frac{-V_{DC}}{2}$ $\therefore V_{AB} = V_{DC}$

$\frac{2\pi}{3}$ to π

$V_{A0} = V_{B0} = \frac{V_{DC}}{2}$

$\therefore V_{AB} = 0$

Pot. of A = Pot. of B

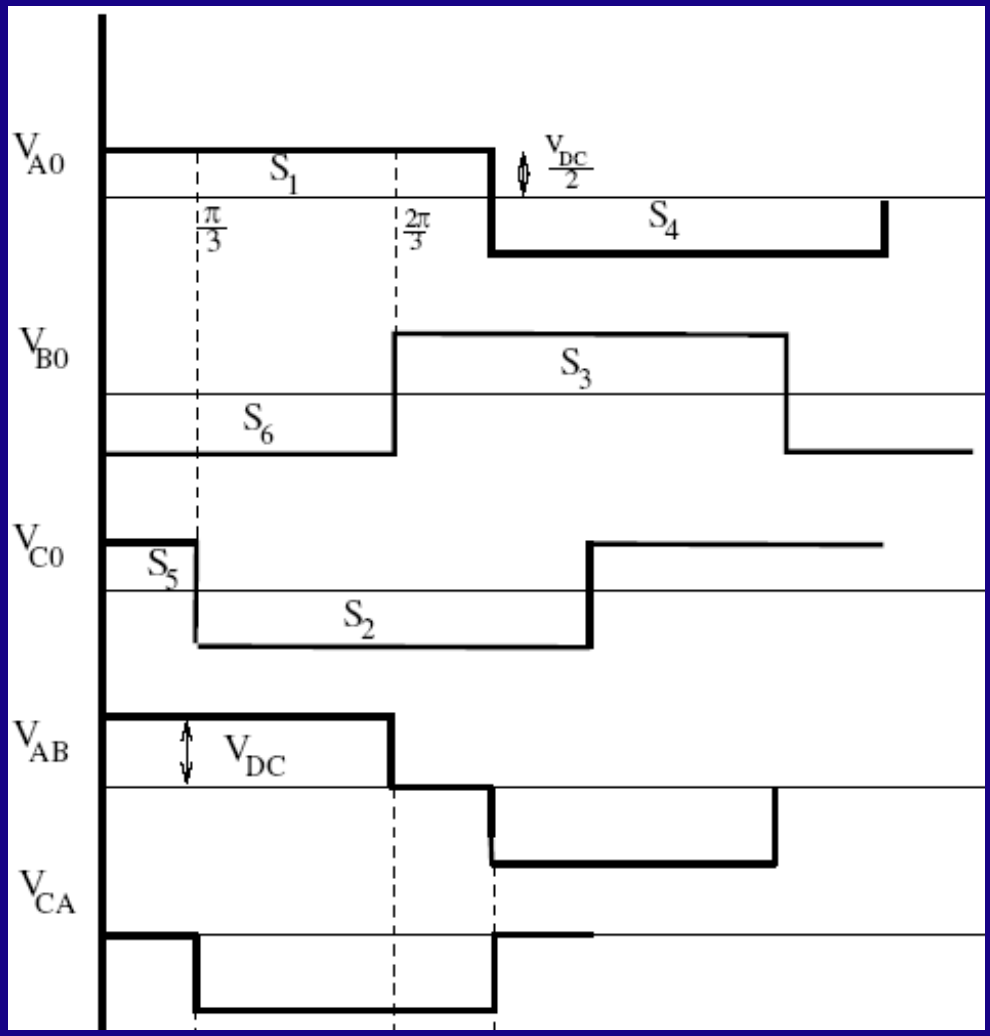
$\Rightarrow$ Either +ve DC Bus

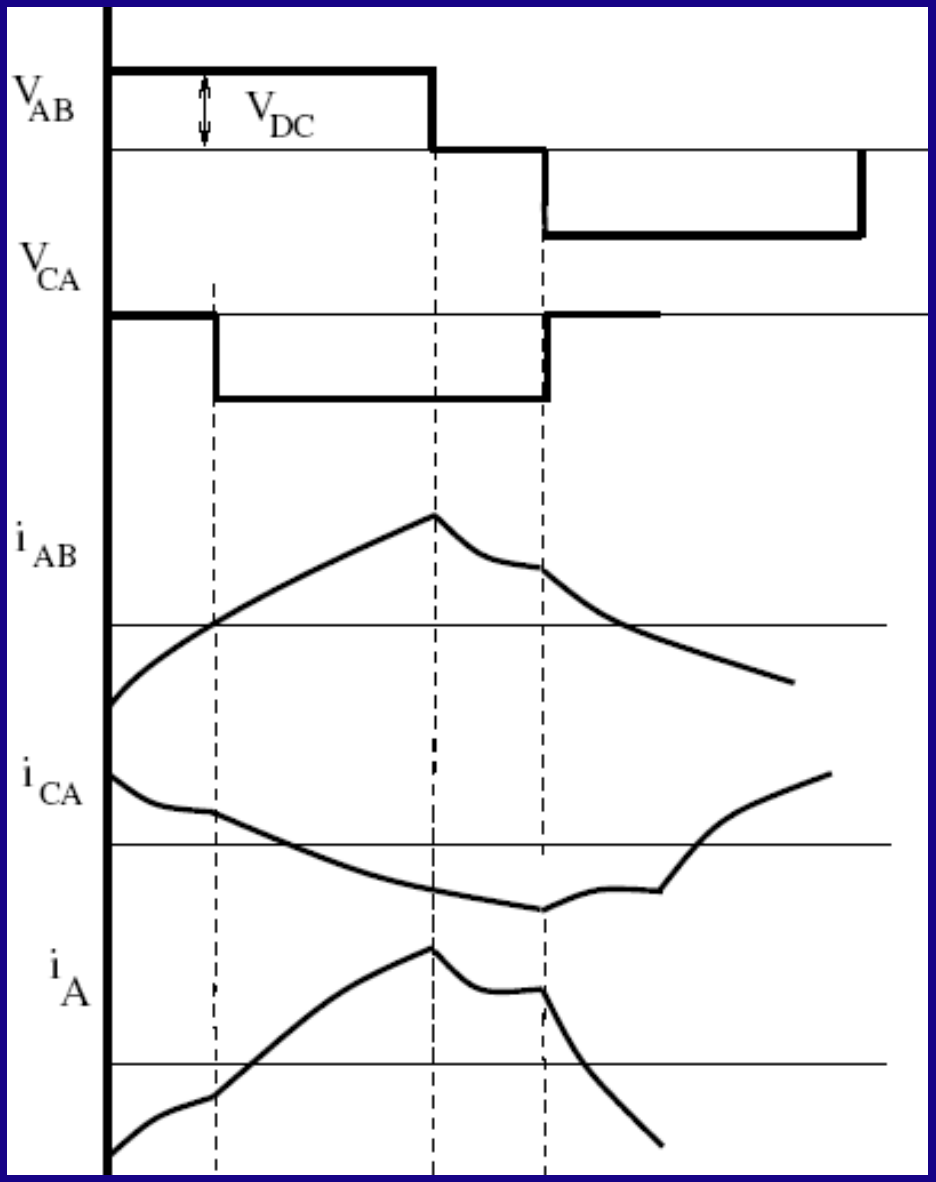
or -ve DC Bus

V_{CA}:

$0 - \frac{\pi}{3} = 0$

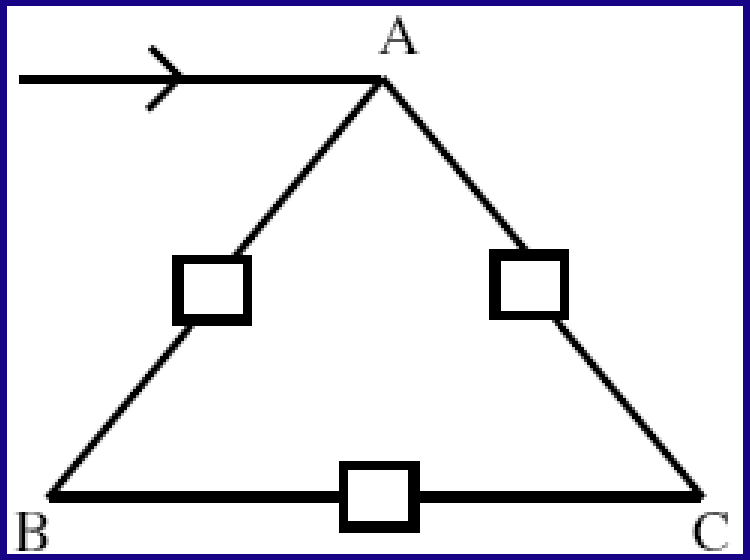
$\frac{\pi}{3} - \pi = -V_{DC}$





Δ connected load

$$i_{AB} = \frac{V_{AB}}{Z} \qquad i_A = i_{AB} - i_{CA}$$



⇒ **Observations :**

There are 6 steps/cycle in load current

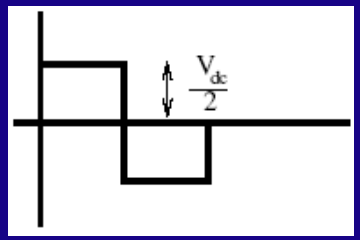
⇒ Six Step Inverter

⇒ V_{A0}, V_{B0}, V_{C0} → pole voltage

V_{AB}, V_{BC}, V_{CA} → predominant harmonic is 5^{th}, 7^{th}, ...

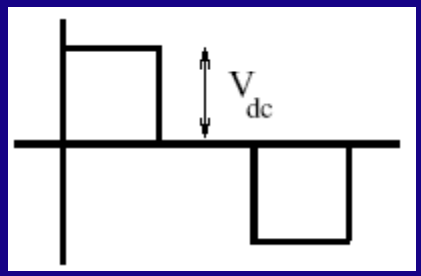
$= (6N \pm 1)$

$$V_{A0} = \frac{4}{\pi}\frac{V_{dc}}{2}\left[\sin \omega t + \frac{1}{3}\sin 3\omega t + \ldots\right]$$



$$V_{AB} = \frac{2\sqrt{3}}{\pi} V_{dc}\left[\sin \omega t - \frac{1}{5}\sin 5\omega t - \ldots\right]$$

$$\text{R.M.S of L-L is } \sqrt{\frac{2}{3}}\, V_{dc} = 0.816\, V_{dc}$$



RMS value of the whole wave= Vdc*(1/3+0+1/3)^0.5

$$\text{Fundamental} = \frac{\sqrt{6}}{\pi} V_{dc} = 0.78\, V_{dc}$$

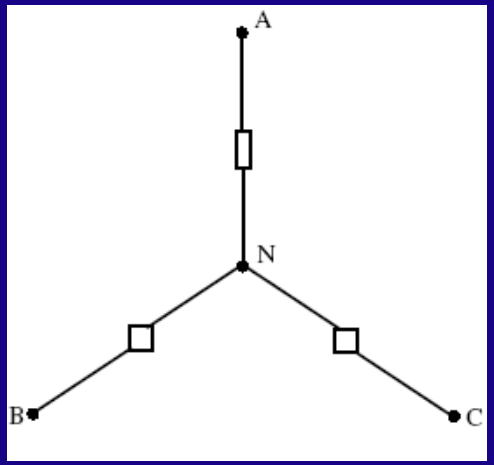
Rms value of sin is 1/ROOT(2)

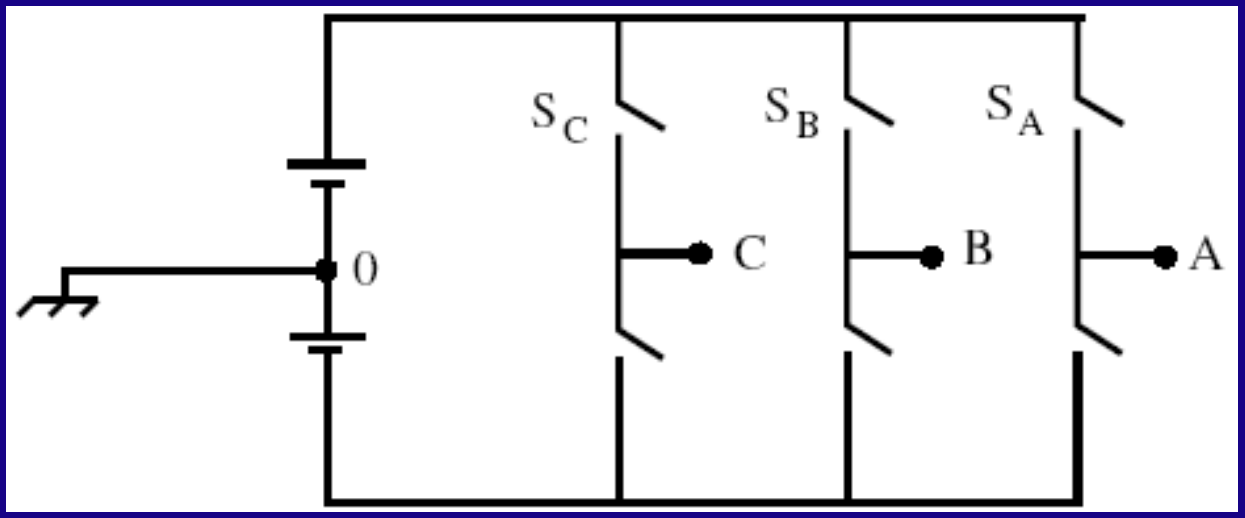
Y Connected Load :

Phase voltage waveform is required

S_1 is ON $\rightarrow$ 'V' w.r.t '0' is known

V.S.I $\rightarrow$ switching signals for the leg of the inverter are complimentary





If status of S_A, S_B, S_C are known, the status of the other switches will also be known.

8 possible combinations (0,0,0) - (1,1,1)

0,0,0 $\rightarrow$ S_A, S_B, S_C are off

$\rightarrow$ Points A, B and C are connected to -ve DC bus

$\rightarrow$ I_L is freewheeling through -ve DC bus

$\Rightarrow$ $V_{AB} = V_{BC} = V_{CA} = 0$

$\Rightarrow$ True for (1,1,1)

$\Rightarrow$ Known as "0 Voltage Vectors"

S_C,	S_B,	S_A
0	0	1

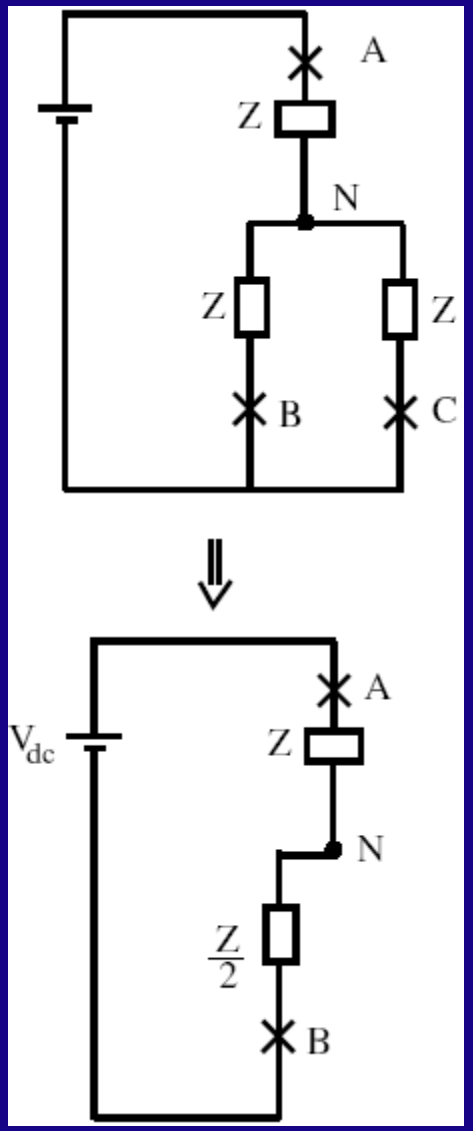
$$\therefore V_{AN} = \frac{2}{3} V_{dc}$$

$$V_{BN} = V_{CN} = -\frac{1}{3} V_{dc}$$

S_C,	S_B,	S_A
0	1	0

$$\therefore V_{BN} = \frac{2}{3} V_{dc}$$

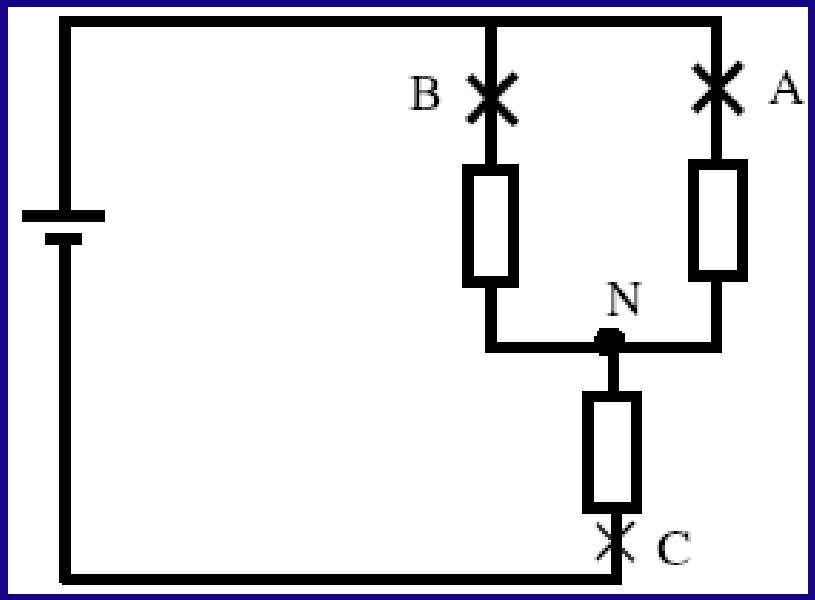
$$V_{CN} = V_{AN} = -\frac{1}{3} V_{dc}$$



S_C,	S_B,	S_A
0	1	1

$$\therefore\ V_{CN} = -\frac{2}{3} V_{dc}$$

$$V_{AN} = V_{BN} = \frac{1}{3} V_{dc}$$



$0 - \frac{\pi}{3}$: $S_A = 1, S_C = 1, S_B = 0$

$\therefore V_{AN} = \frac{1}{3} V_{dc}$

$\frac{\pi}{3} - \frac{2\pi}{3}$: $S_A = 1, S_C = 0, S_B = 0$

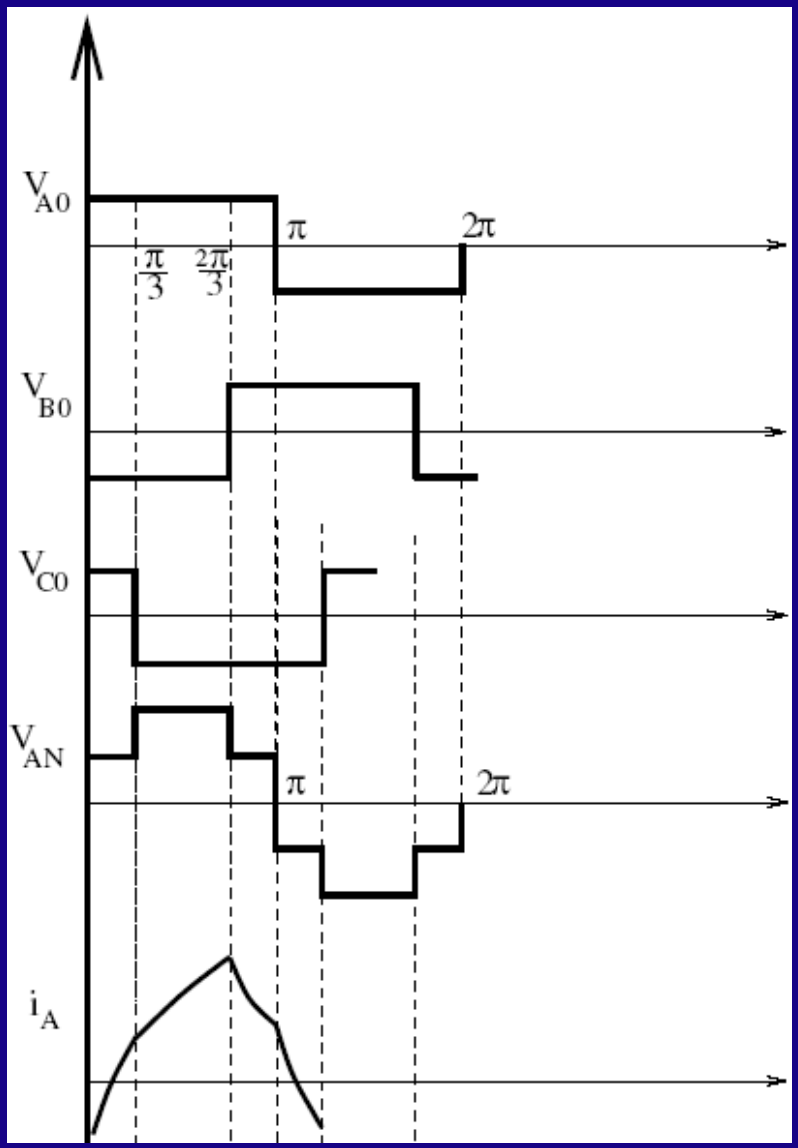
$\therefore V_{AN} = \frac{2}{3} V_{dc}$

$\frac{2\pi}{3} - \pi$: $S_A = 1, S_C = 0, S_B = 1$

$\therefore V_{AN} = \frac{1}{3} V_{dc}$

$\Rightarrow V_{AN} \rightarrow$ 6 steps/cycle

$\rightarrow$ 6 step inverter



⇒ Both phase voltage & line current has 6 step/cycle

⇒ 6 step inverter

⇒ Frequency of harmonics=$(6N \pm 1)F_1$

$F_1 \rightarrow$ Frequency of the fundamental

⇒ This could change

⇒ could be 1Hz , 10Hz or 50Hz

under these condition frequency of predominet harmonics

⇒ 5Hz, 50Hz, 250Hz

⇒ Impossible to filter