Ripple factor of Rectifiers

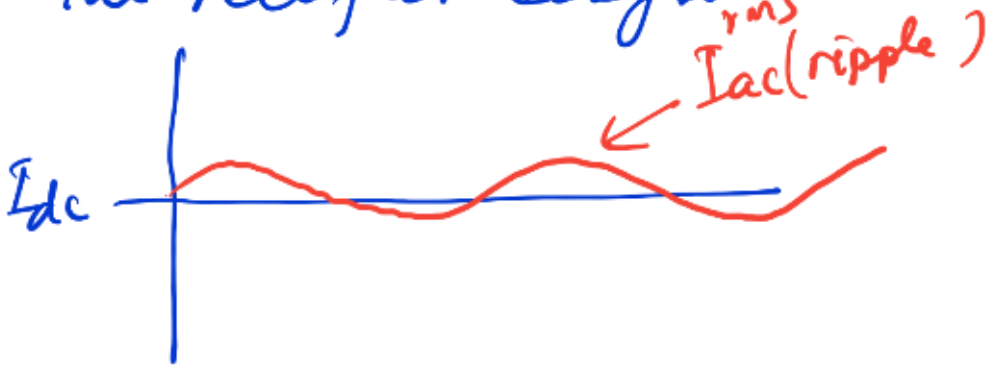
Ripple factor

The output of rectifier has dc component and ac component (referred as ripple) we can define ripple factor as:

$$\text{Ripple factor} = \frac{\text{rms value of ac component}}{\text{value of dc component}}$$

$$= \frac{I_{ac(rms)}}{I_{dc}} \text{ or } \frac{V_{ac(rms)}}{V_{dc}}$$

Lower be the ripple factor, better will be the rectifier design.



effective rms value of total load current

$$I_{rms} = \sqrt{I_{dc}^2 + I_{ac}^2}$$

$$I_{ac} = \sqrt{I_{rms}^2 - I_{dc}^2}$$

ripple factor

$$= \frac{I_{ac}}{I_{dc}} = \frac{1}{I_{dc}} \sqrt{I_{rms}^2 - I_{dc}^2} = \sqrt{\frac{I_{rms}^2}{I_{dc}^2} - 1}$$

For HW

$$I_{rms} = \frac{I_m}{2}, \quad I_{dc} = \frac{I_m}{\pi}$$

ripple factor (HW) = 1.21

For Full wave

$$I_{rms} = \frac{I_m}{\sqrt{2}} \; ; \; I_{dc} = \frac{2I_m}{\pi}$$

$$\text{ripple factor} = \sqrt{\frac{(I_m/\sqrt{2})^2}{(2I_m/\pi)^2} - 1}$$

$$= 0.48$$