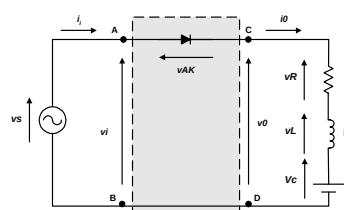


RETIFICADORES MONOFÁSICOS DE MEIA-ONDA

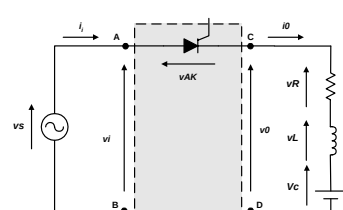
PARTE II

Prof. Azauri A. de Oliveira Jr.

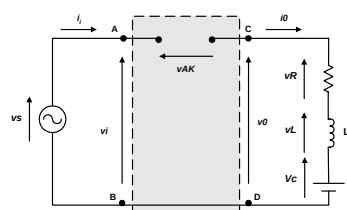
RETIFICADOR MONOFÁSICO DE MEIA-ONDA (CARGA COM FEM)



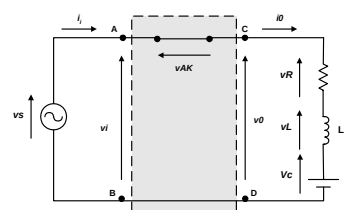
RETIFICADOR NÃO CONTROLADO



RETIFICADOR CONTROLADO

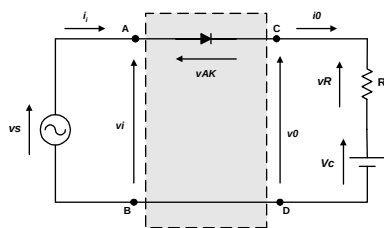


DIODO (OU SCR) NO CORTE

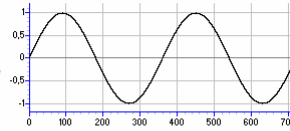


DIODO (OU SCR) EM CONDUÇÃO

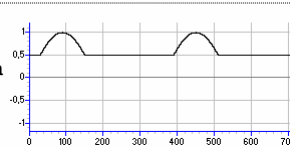
RETIFICADOR NÃO CONTROLADO – CARGA R-FEM (FORMAS DE ONDA)



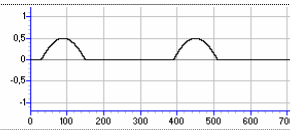
Tensão da Fonte



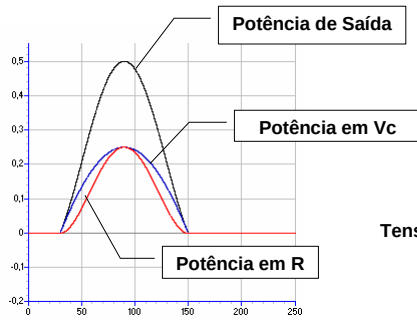
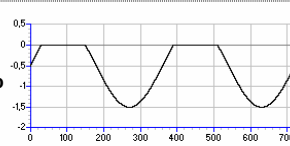
Tensão da Carga



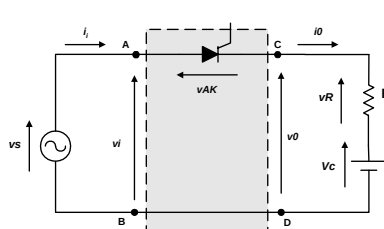
Corrente



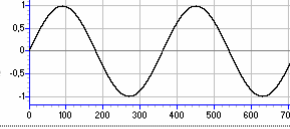
Tensão no Diodo



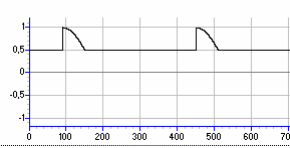
RETIFICADOR CONTROLADO – CARGA R-FEM (FORMAS DE ONDA)



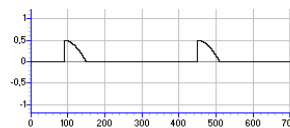
Tensão da Fonte



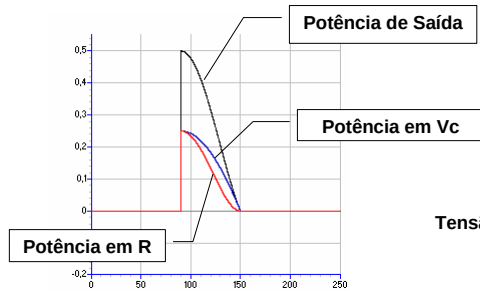
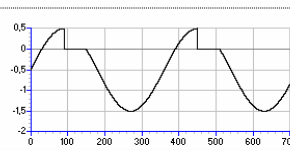
Tensão da Carga



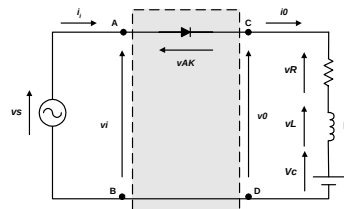
Corrente



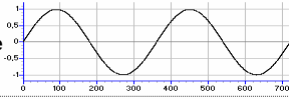
Tensão no SCR



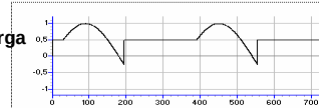
RETIFICADOR NÃO CONTROLADO – CARGA RL-FEM (FORMAS DE ONDA)



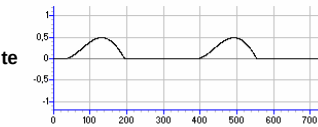
Tensão da Fonte



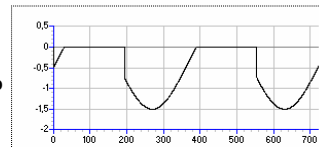
Tensão da Carga



Corrente



Tensão no Diodo

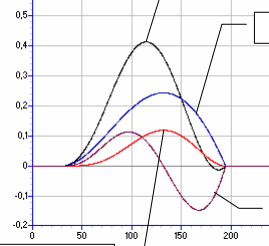


Potência de Saída

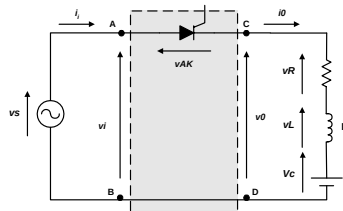
Potência em Vc

Potência em L

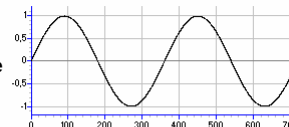
Potência em R



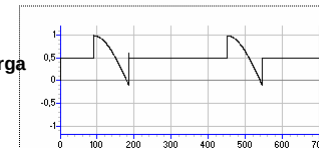
RETIFICADOR CONTROLADO – CARGA RL-FEM (FORMAS DE ONDA)



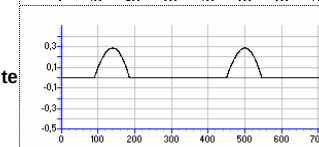
Tensão da Fonte



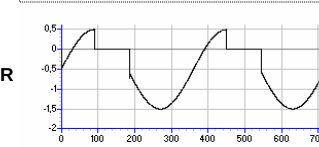
Tensão da Carga



Corrente



Tensão no SCR

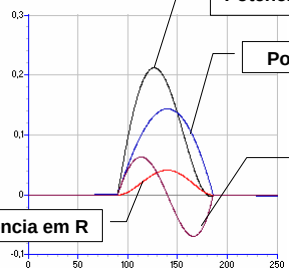


Potência de Saída

Potência em Vc

Potência em L

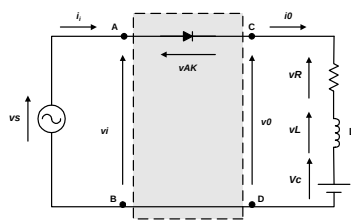
Potência em R



Retificadores Monofásicos de Meia-Onda

Curvas de Projeto

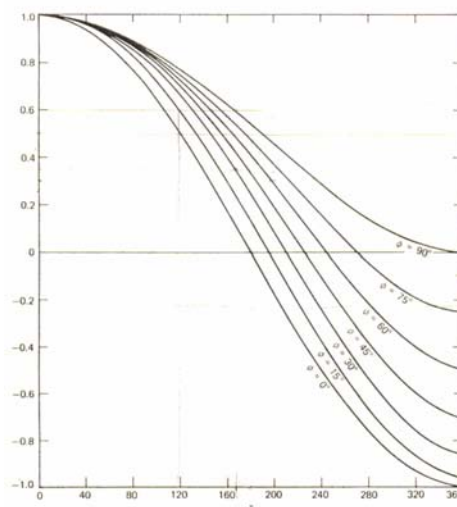
RETIFICADOR MONOFÁSICO DE MEIA-ONDA NÃO CONTROLADO Ângulo de Condução – Carga RL+fem



$$\frac{(m / \cos \phi) - \sin(\eta + \gamma - \phi)}{(m / \cos \phi) - \sin(\eta - \phi)} = e^{-\gamma / \tan \phi}$$

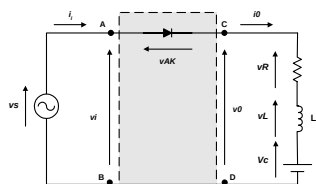
$$\gamma = \beta - \eta$$

$$\eta = \arcsen(m) = \arcsen\left(\frac{V_c}{\sqrt{2} \cdot V}\right)$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA NÃO CONTROLADO

Correntes média normalizadas – Carga RL+fem

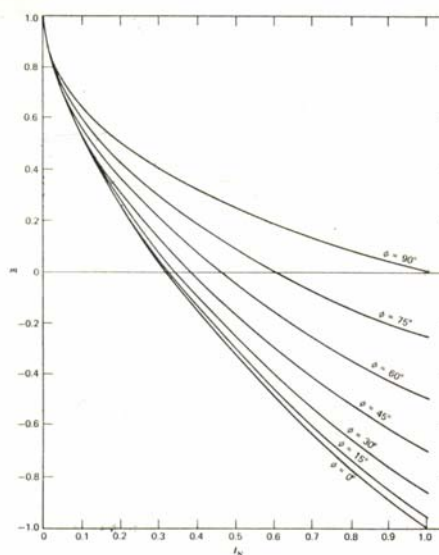


$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B e^{-\omega t / \tan \phi} \right]$$

$$B = \left[\frac{m}{\cos \phi} - \sin(\eta - \phi) \right] e^{\eta / \tan \phi}$$

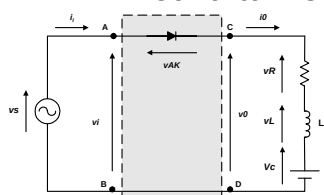
$$i_N = \frac{i(\omega t)}{I_{base}} ; \quad I_{base} = \sqrt{2} V / Z$$

$$I_N = \frac{1}{2\pi} \int_{\eta}^{\beta = \gamma + \eta} i_N d\omega t$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA NÃO CONTROLADO

Corrente rms normalizadas – Carga RL+fem

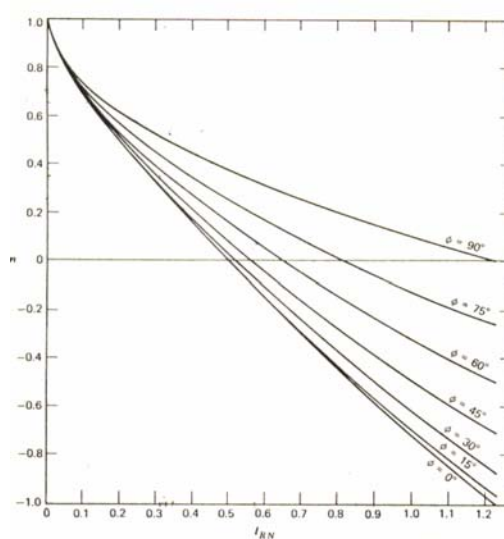


$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B e^{-\omega t / \tan \phi} \right]$$

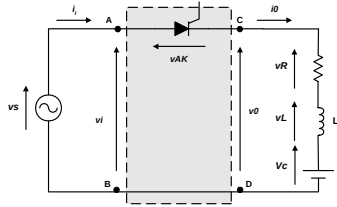
$$B = \left[\frac{m}{\cos \phi} - \sin(\eta - \phi) \right] e^{\eta / \tan \phi}$$

$$i_N = \frac{i(\omega t)}{I_{base}} ; \quad I_{base} = \sqrt{2} V / Z$$

$$I_{RN} = \sqrt{\frac{1}{2\pi} \int_{\eta}^{\beta = \gamma + \eta} i_N^2 d\omega t}$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Ângulo de Condução – Carga RL+fem

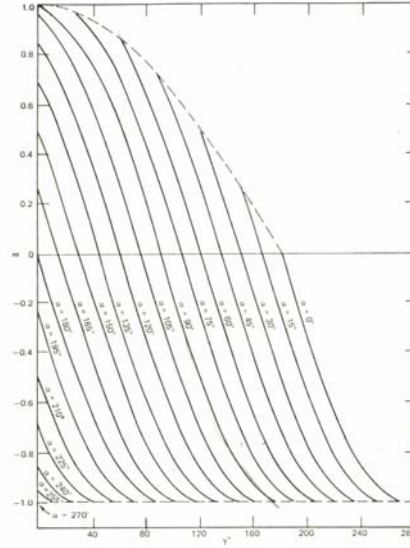


$$\frac{(m / \cos \phi) - \operatorname{sen}(\alpha + \gamma - \phi)}{(m / \cos \phi) - \operatorname{sen}(\alpha - \phi)} = e^{-\gamma / \tan \phi}$$

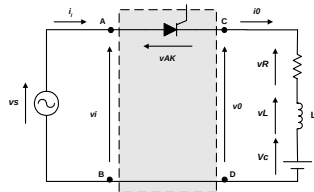
$$\gamma = \beta - \alpha$$

$$\eta = \arcsen(m) = \arcsen\left(\frac{V_c}{\sqrt{2} \cdot V}\right)$$

$$\phi = 0^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Corrente Média Normalizada – Carga RL+fem

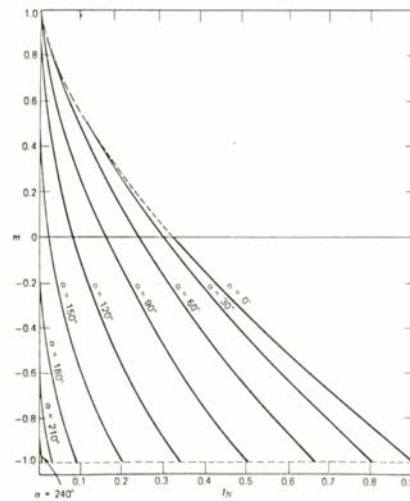


$$i_N = \operatorname{sen}(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B \cdot e^{(\alpha - \omega t) / \tan \phi} \right]$$

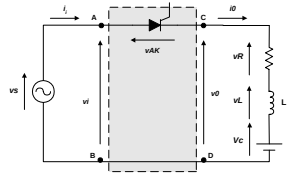
$$B = \left[\frac{m}{\cos \phi} - \operatorname{sen}(\alpha - \phi) \right]$$

$$i_N = \frac{i(\omega t)}{I_{base}} \quad ; \quad I_{base} = \sqrt{2} \cdot V / Z$$

$$I_{RN} = \frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N \cdot d\omega t \quad ; \quad \phi = 0^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Corrente RMS Normalizada – Carga RL+fem

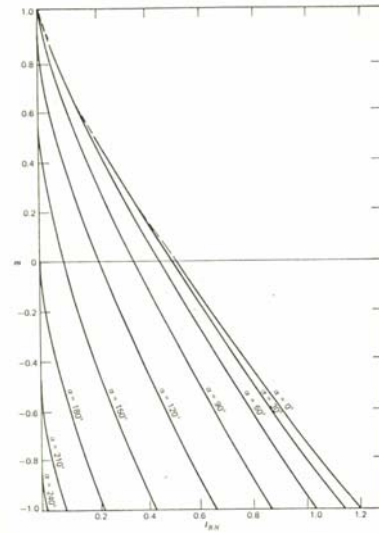


$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B.e^{(\alpha - \omega t) \tan \phi} \right]$$

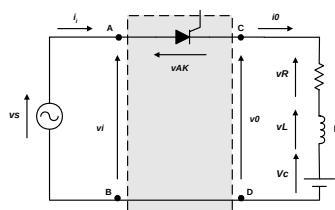
$$B = \left[\frac{m}{\cos \phi} - \sin(\alpha - \phi) \right]$$

$$i_N = i(\omega t) / I_{base} \quad ; \quad I_{base} = \sqrt{2} \cdot V / Z$$

$$I_{RN} = \sqrt{\frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N^2 d\omega t} \quad ; \quad \phi = 0^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Ângulo de Condução – Carga RL+fem

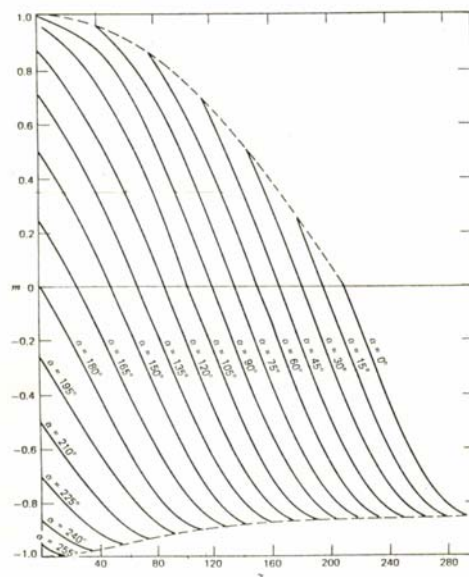


$$\frac{(m / \cos \phi) - \sin(\alpha + \gamma - \phi)}{(m / \cos \phi) - \sin(\alpha - \phi)} = e^{-\gamma / \tan \phi}$$

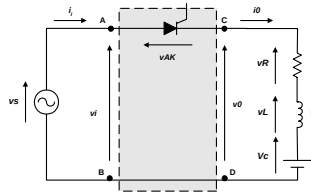
$$\gamma = \beta - \alpha$$

$$\eta = \arcsen(m) = \arcsen\left(\frac{V_c}{\sqrt{2} \cdot V}\right)$$

$$\phi = 30^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Corrente Média Normalizada – Carga RL+fem

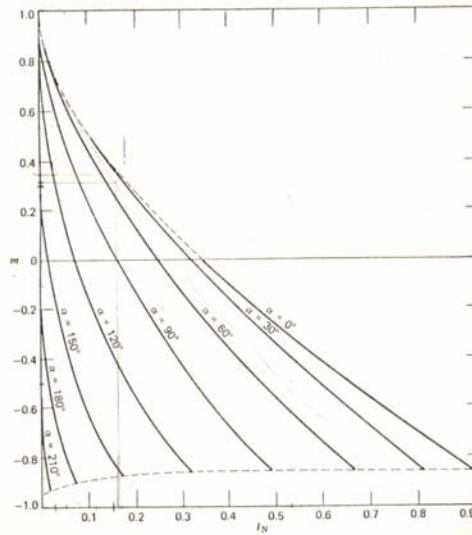


$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B e^{(\alpha - \omega t)/\tan \phi} \right]$$

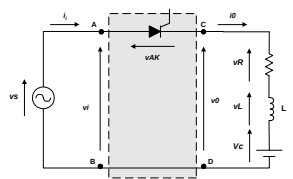
$$B = \left[\frac{m}{\cos \phi} - \sin(\alpha - \phi) \right]$$

$$i_N = \frac{i(\omega t)}{I_{base}} \quad ; \quad I_{base} = \frac{\sqrt{2} V}{Z}$$

$$I_{RN} = \frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N d\omega t \quad ; \quad \phi = 30^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Corrente RMS Normalizada – Carga RL+fem

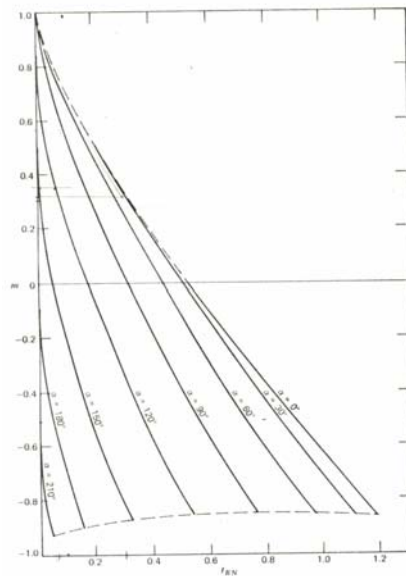


$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B e^{(\alpha - \omega t)/\tan \phi} \right]$$

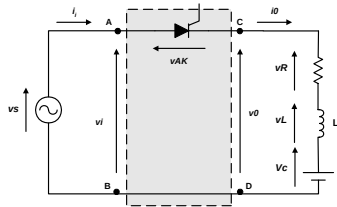
$$B = \left[\frac{m}{\cos \phi} - \sin(\alpha - \phi) \right]$$

$$i_N = \frac{i(\omega t)}{I_{base}} \quad ; \quad I_{base} = \frac{\sqrt{2} V}{Z}$$

$$I_{RN} = \sqrt{\frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N^2 d\omega t} \quad ; \quad \phi = 30^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Ângulo de Condução – Carga RL+fem

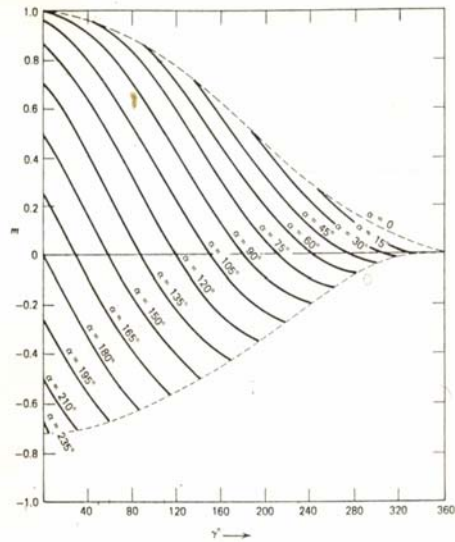


$$\frac{(m / \cos \phi) - \operatorname{sen}(\alpha + \gamma - \phi)}{(m / \cos \phi) - \operatorname{sen}(\alpha - \phi)} = e^{-\gamma / \tan \phi}$$

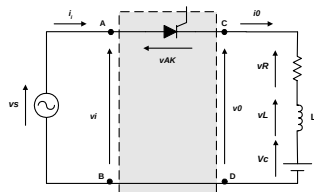
$$\gamma = \beta - \alpha$$

$$\eta = \arcsen(m) = \arcsen\left(\frac{V_c}{\sqrt{2} \cdot V}\right)$$

$$\phi = 90^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO Corrente Média Normalizada – Carga RL+fem

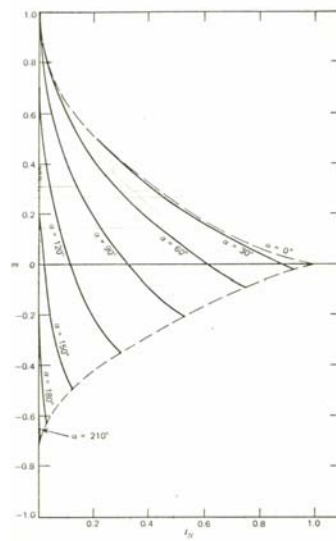


$$i_N = \operatorname{sen}(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B e^{(\alpha - \omega t) / \tan \phi} \right]$$

$$B = \left[\frac{m}{\cos \phi} - \operatorname{sen}(\alpha - \phi) \right]$$

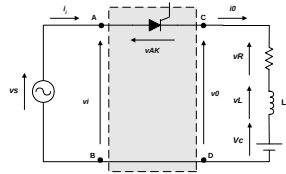
$$i_N = \frac{i(\omega t)}{I_{base}} \quad ; \quad I_{base} = \sqrt{2} \cdot V / Z$$

$$I_{RN} = \frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N \cdot d\omega t \quad ; \quad \phi = 90^\circ$$



RETIFICADOR MONOFÁSICO DE MEIA-ONDA CONTROLADO

Corrente RMS Normalizada – Carga RL+fem



$$i_N = \sin(\omega t - \phi) - \left[\frac{m}{\cos \phi} - B.e^{(\alpha - \omega t) \tan \phi} \right]$$

$$B = \left[\frac{m}{\cos \phi} - \sin(\alpha - \phi) \right]$$

$$i_N = \frac{i(\omega t)}{I_{base}} \quad ; \quad I_{base} = \frac{\sqrt{2} \cdot V}{Z}$$

$$I_{RN} = \sqrt{\frac{1}{2\pi} \int_{\alpha}^{\beta = \gamma + \alpha} i_N^2 d\omega t} \quad ; \quad \phi = 90^\circ$$

