Credits: Α. Τσεριώνης

Παράδειγμα 1

Αντωνόπουλος

- $P_{dc}(t) = i_{dc}(t) \cdot u_{dc}(t)$
- $P = \frac{1}{T}\int_0^t \underbrace{i_{dc}(t)}_{10A} \cdot u_{dc}(t)\, dt = 10 \cdot \frac{1}{T}\int_0^T u_{dc}(t)\, dt =$

$$= 10 \cdot \frac{1}{2\pi} \cdot 2 \int_0^{\pi/2} \sqrt{2} \cdot 380 \cdot \cos(\omega t)\, d(\omega t) = \frac{20}{\pi}\sqrt{2}\, 380 \left[\sin(\omega t)\right]_0^{\pi/2} \Rightarrow P = \frac{20\sqrt{2}\,380}{\pi} = 3{,}42\,kW$$

- $I_{ac,rms} = \sqrt{\frac{1}{T}\int_0^T i_{ac}^2(t)\, dt} = \sqrt{\frac{1}{T}\int_0^T I_{dc}^2\, dt} = 10\,A$

- $P_{εισόδου} = \underset{380}{\underset{\parallel}{V_{ac,rms}}} \cdot \underset{10}{\underset{\parallel}{I_{ac,rms}}} \cdot \underset{1\,(\varphi=0)}{\underset{\parallel}{\cos\varphi}} = 3{,}8\,kW$ λάθος, δεν ισχύει!

- $b_n = 0$, $a_n = \frac{1}{T/4}\int_0^{T/2} f(t)\cdot\cos(n\omega t)\, d(\omega t) = \frac{4}{2\pi}\left[\int_0^{\pi/2}\cos(n\omega t)\, d(\omega t) + \int_{\pi/2}^{\pi}(-10)\cos(n\omega t)\, d(\omega t)\right] =$

$$= \frac{2}{\pi}\left[\frac{10}{n}\left[\sin(n\omega t)\right]_0^{\pi/2} - \frac{10}{n}\left[\sin(n\omega t)\right]_{\pi/2}^{\pi}\right] = \frac{2\cdot 10}{\pi\cdot n}\left[\sin\left(n\frac{\pi}{2}\right) - \underset{0}{\underset{\parallel}{\sin(n\cdot 0)}} - \underset{0}{\underset{\parallel}{\sin(n\cdot\pi)}} + \sin\left(n\frac{\pi}{2}\right)\right] =$$

$$= \frac{4\cdot 10}{\pi\cdot n}\sin\left(n\frac{\pi}{2}\right) = \begin{cases} a_n = 0, & n \text{ άρτιο} \\ |a_n| = \frac{4\cdot 10}{\pi\cdot n}, & n \text{ περιττό} \end{cases}$$

$$f(t) = \frac{4\cdot 10}{\pi}\cos(\omega t) - \frac{4\cdot 10}{\pi 3}\cos(3\omega t) + \frac{4\cdot 10}{\pi 3}\cos(5\omega t) - \dots$$

$$P_{εισόδου} = \underset{380}{\underset{\parallel}{V_{ac,rms}}} \cdot \underset{4\cdot 10/\pi\sqrt{2}}{\underset{\parallel}{I_{ac,rms}}} \cdot \underset{1\,(\varphi=0)}{\underset{\parallel}{\cos\varphi}} = 3{,}42\,kW$$

$$Q_1 = V_{ac,rms} \cdot I_{ac,rms} \cdot \underset{0\,(\varphi=0)}{\underset{\parallel}{\sin\varphi}} = 0$$

$$S = V_{ac,rms} \cdot I_{ac,rms} = 380\,V \cdot 10A = 3800\,VA$$

$$\lambda = \Sigma I = \frac{P}{S} = \frac{3{,}42}{3{,}8} = 0{,}9 \neq \cos\varphi_1$$

$$D = \sqrt{S^2 - P^2} = \sqrt{3{,}8^2 - 3{,}42^2} = 1{,}66\,kVA$$

Παράδειγμα 2

$$V_{rms} = \sqrt{\left(\frac{42}{\sqrt{2}}\right)^2 + \left(\frac{5}{\sqrt{2}}\right)^2 + \left(\frac{9}{\sqrt{2}}\right)^2} = \frac{1}{\sqrt{2}}\sqrt{42^2 + 5^2 + 9^2} = 30{,}6\,V$$

$$I_{rms} = \sqrt{\left(\frac{5}{\sqrt{2}}\right)^2 + \left(\frac{2}{\sqrt{2}}\right)^2} = 3{,}8A$$

$$S = 30{,}6V \cdot 3{,}8A = 116{,}3\,VA$$

$$P = V_{1,rms} \cdot i_{1,rms} \cdot \cos\varphi_1 = \frac{42}{\sqrt{2}} \cdot \frac{5}{\sqrt{2}} \cdot \frac{\sqrt{3}}{\sqrt{2}} = 90{,}9\,W$$

$$(+\, V_{3,rms} \cdot i_{3,rms} \cdot \cos\varphi_3)$$

$$\lambda = \frac{P}{S} = \frac{90{,}9}{116{,}3} = 0{,}78$$

$$Q = V_{1,rms} \cdot i_{1,rms} \cdot \sin\varphi_1 = \frac{42}{\sqrt{2}} \cdot \frac{5}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} = 52{,}5 \ VA_r$$

$$D = \sqrt{S^2 - P^2 - Q^2} = 50 \ VA$$

$$I_{d,rms} = I_{s,rms} = \frac{V_{d,rms}}{d} = \frac{\sqrt{2}}{2} \frac{V_s}{R}$$

$$V_{d,rms} = \sqrt{\frac{1}{2\pi} \int_0^{\pi} [\sqrt{2} V_s \sin(\omega t)]^2 \, d(\omega t)} = \sqrt{\frac{(\sqrt{2} V_s)^2}{2\pi} \int_0^{\pi} \sin^2(\omega t) \, d(\omega t)} = \sqrt{2} V_s \sqrt{\frac{1}{2\pi} \cdot \frac{1}{2} \left[\omega t - \frac{1}{2} \sin(2\omega t)\right]_0^{\pi}} =$$

$$\cos^2 x - \sin^2 x = \cos 2x \Rightarrow$$

$$\Rightarrow \sin^2 x = \frac{1 - \cos 2x}{2}$$

$$= \frac{\sqrt{2} V_s}{2} \sqrt{\frac{1}{\pi} (\pi - 0 - 0 + 0)} = \frac{\sqrt{2} V_s}{2} \neq V_s$$

$$\bar{V}_d = \frac{\sqrt{2} V_s}{\pi}$$