Technical Bulletin

NO. 747

TOPIC: VOLT-HOURS x AMP-HOURS IS NOT EQUAL TO WATT HOURS.

File TEC747b

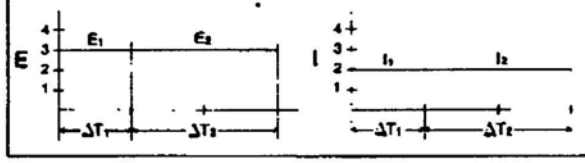
In DynAmp's experience of many years in the electro-chemical industry, there is still one fundamental error concerning Watt-hours calculations. There is not a clear understanding by everyone that if you take Volt-hours x amp-hours, this does not equal Watt-hours. This bulletin attempts to explain why this is true.

$\left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right)$ May not be always equal to dc power

Question: $\left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right)$ equals average dc power, TRUE or FALSE?

The answer to that question is:

TRUE when voltage and current are both constant

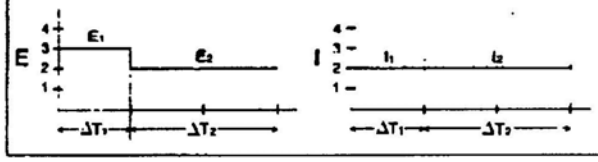


$P_{d\text{-}c(aver.)} = \left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right) = 18$ units

OR

$P = E_1I_1T_1 + E_2I_2T_2 = 18$ units

TRUE when voltage is variable but current is constant

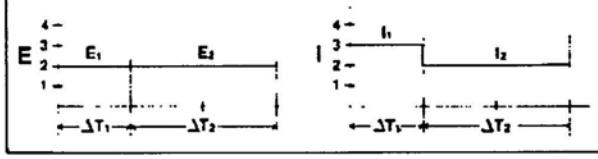


$P_{d\text{-}c(aver.)} = \left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right) = 14$ units

OR

$P = E_1I_1T_1 + E_2I_2T_2 = 14$ units

TRUE when current is variable but voltage is constant

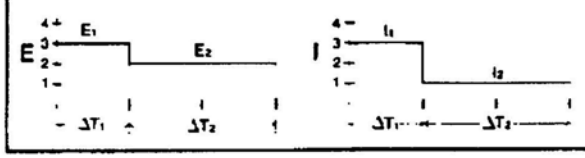


$P_{d\text{-}c(aver.)} = \left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right) = 14$ units

OR

$P = E_1I_1T_1 + E_2I_2T_2 = 14$ units

FALSE when voltage and current are both variable



$P_{d\text{-}c(aver.)} = \left(\frac{1}{T}\int E\,dt\right)\cdot\left(\frac{1}{T}\int I\,dt\right) = 11.6$ units

but does not correspond to

$P = E_1I_1T_1 + E_2I_2T_2 = 13$ units