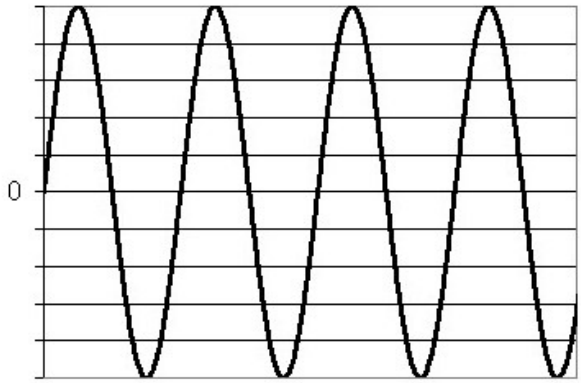
DC Power Supplies

Almost all electronic equipment runs on DC, but the power supplied across the world is almost universally AC, which has no DC component. The following oscilloscope trace shows a typical AC sinusoid, used in transmitting power.



For this signal, the Average Voltage, which corresponds roughly to the DC, is zero -- the signal spends as much time above the zero marker as it does below.

However, it's clear from experience that there is quite a bit of power available. How can that be, if P=IV, and V = 0? The answer is that power is based upon the Root Mean Squared Voltage (V_{RMS}), not the average voltage (V_{ave}). RMS is determined for a cycle of a signal by squaring each point, taking the average, then taking the square root of the result. Doing that accurately involves integrating the square of the signal, then taking the square root. For a sine wave, this produces the result

$$V_{RMS} = \frac{V_p}{\sqrt{2}}$$

Other waveforms have different results. For example, a triangle wave's $V_{RMS} = \frac{V_p}{\sqrt{3}}$. A square wave's $V_{RMS} = V_{\max}$, and a DC signal's $V_{RMS} = V_{ave} = V_{DC}$

So, all of these waveforms have power. If only we could find a way to harness that power as DC rather than AC.

Question: DC can be isolated from AC power simply by filtering out the high frequency components using a Low Pass Filter, leaving only the DC, or 0 Hz, component.

- ○ True
- ◉ False