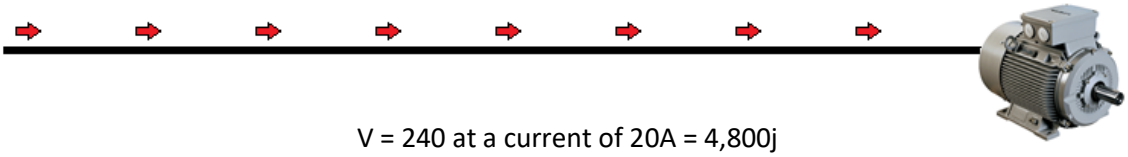
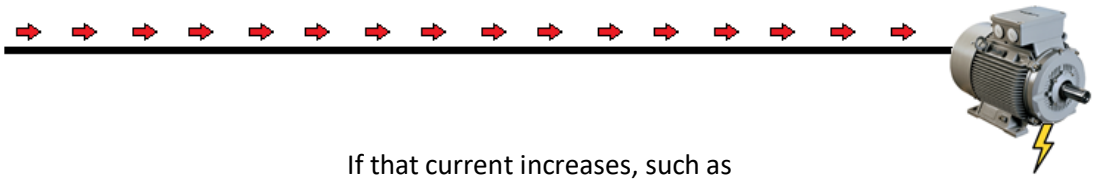
Thermal Imaging & the Heating Effects Related to Power Quality

Thermal imaging locates hot spots by examining the IR spectrum.
Excessive current or high impedance will elevate heat in a system.

As current flows through a system, it will produce energy in the form of heat or IR radiation.



V = 240 at a current of 20A = 4,800j



If that current increases, such as during a fault then the heat energy increases as well.

V = 240 at a current of 50A = 12,000j

Poor connections can also be identified by using a thermal imager.

A connection can be treated as a resistance. As current flows through the resistance there is a voltage drop across it with an associated heating effect. For example; if the connection resistance is 100μΩ and the current passing through it is 20A then the heat generated will be on the order of 0.002j. However if the connection resistance should increase to 10mΩ then the heat generated will be on the order of 0.2j. This is an increase of 100 times.

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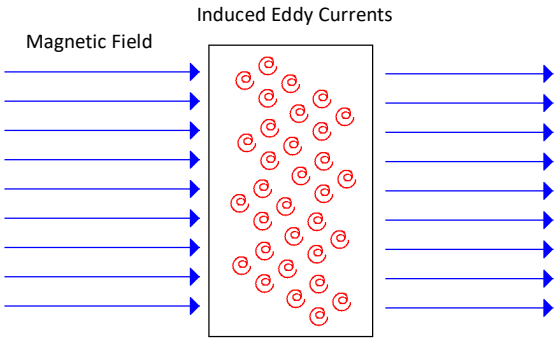
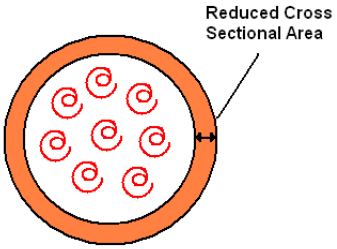
Harmonics produce eddy currents in wires. These are small circular currents. Eddy currents in turn produce magnetic fields that are opposite to the flow of current through the wire. They will force the current to the outside of the wire. This is known as skin effect.



The magnetic field produced by Eddy currents always opposes the magnetic field that produced the Eddy currents

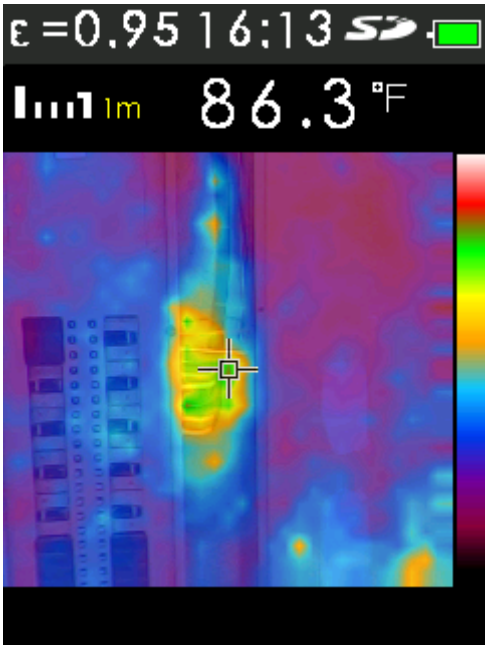


The greater the skin effect the less cross sectional area of the wire is used to pass the current. This will lead to increased heating of the wire.

Fuses as well as some types of breakers are thermal devices. Therefore, harmonics can affect them as well. They can lead to blown fuses or opening breakers.

Thermal imaging can assist in isolating a power quality issue by identifying the hot spots, allowing you to locate areas with high currents, poor connections and heating due to high harmonic.

Use the thermal imager to scan a location. If a hot spot is identified, connect the MPQ and view the current and current harmonics.



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