Ohm's Law

$E = IZ$ $P = IE$

E = volts
I = current in amps
Z = impedance or resistance in ohms
P = power in watts

Transformer Input and Output

$E_P I_P = E_S I_S$

E_P = primary voltage
I_P = primary current in amps
E_S = secondary voltage
I_S = secondary current in amps

Capacitive Reactance

$$X_C = \frac{1}{2\pi FC}$$

X_C = capacitive reactance in ohms
F = frequency in hertz
C = capacitance in farads

Inductive Reactance

$$X_L = 2\pi FL$$

X_L = inductive reactance in ohms
F = frequency in hertz
L = inductance in henrys

Resonant Circuit Formula

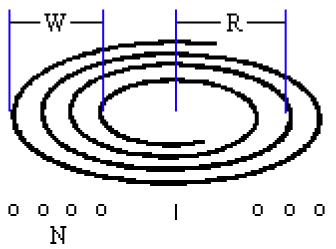
$$4\pi^2F^2LC = 1$$

$$F = \frac{1}{2\pi\sqrt{LC}}$$

F = frequency in hertz
L = inductance in henrys
C = capacitance in farads

Spiral Coil Inductance

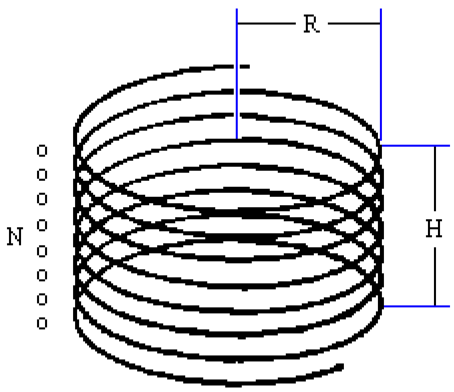
$$L = \frac{(NR)^2}{8R + 11W}$$



L = inductance of coil in microhenrys (μH)
R = average radius of the coil in inches
N = number of turns
W = width of the coil in inches

Helical Coil Inductance

$$L = \frac{(NR)^2}{9R + 10H}$$

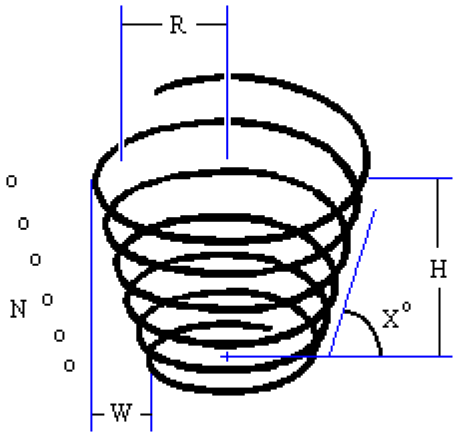


L = inductance of coil in microhenrys (μH)
N = number of turns
R = radius of coil in inches (Measure from the center of the coil to the middle of the wire.)
H = height of coil in inches

Inverse Conical Coil Inductance

$$L_1 = \frac{(NR)^2}{9R + 10H} \quad L_2 = \frac{(NR)^2}{8R + 11W}$$

$$L = \sqrt{(L_1 \sin(x))^2 + (L_2 \cos(x))^2}$$



L = inductance of coil in microhenrys (μH)
L_1 = helix factor
L_2 = spiral factor
N = number of turns
R = average radius of coil in inches
H = effective height of the coil in inches
W = effective width of the coil in inches

X = rise angle of the coil in degrees

Secondary Coil Dimensions

$$L = \frac{\pi D A H}{12} \qquad T = AH \qquad A = \frac{1}{B}$$

L = length of wire in feet
D = outer diameter of coil form in inches
H = height of windings in inches
A = number of turns per inch
T = total number of turns
B = thickness of wire in inches

Medhurst

$$C = 0.29\,L + 0.41\,R + 1.94\sqrt{\frac{R^3}{L}}$$

C = self capacitance in picofarads
R = radius of secondary coil in inches
L = length of secondary coil in inches

Toroid Capacitance

$$C = 1.4\left(1.2781 - \frac{D_2}{D_1}\right)\sqrt{\pi D_2 (D_1 - D_2)}$$

C = capacitance in picofarads
D_1 = outside diameter of toroid in inches
D_2 = diameter of cross section of toroid in inches
This equation courtesy Bert Pool.

Sphere Capacitance

$$C = \frac{25.4\,R}{9}$$

C = capacitance in picofarads
R = radius in inches

Plate Capacitors

$$C = \frac{0.224\,KA(N - 1)}{1{,}000{,}000\,D}$$

C = capacitance in microfarads
K = dielectric constant
A = area of each plate in square inches
N = number of plates
D = distance between plates in inches (thickness of dielectric)

Leyden Jar Capacitors

$$C = \frac{0.224\pi KD(H + 0.25D)}{1{,}000{,}000T}$$

C = capacitance in microfarads
K = dielectric constant
D = diameter of jar in inches
H = height of jar in inches
T = thickness of jar in inches

AC RMS and Peak Voltage

$$E_{RMS} = 0.7071 \cdot E_P$$

E_{RMS} = RMS voltage
E_P = peak voltage

Rotary Spark Gap Firings per Second

$$F = \frac{RE}{60}$$

F = firings per second (hertz)
R = motor RPM rating
E = number of rotary electrodes

Rotary Spark Gap Electrode Speed

$$S = \frac{\pi RD}{1056}$$

S = electrode speed (MPH)
R = motor RPM rating
D = diameter of electrode placement circle (inches)

Energy for L and C

Capacitance	Inductance
$J = 0.5\ V^2\ C$	$J = 0.5\ I^2\ L$

J = joules of energy stored
V = peak charge voltage
I = peak current
C = capacitance in farads
L = inductance in henries

I stated peak values of V and I because I want to emphasize not to use RMS values. The energy stored at any given time is of course: $J(t) = 0.5\ [V(t)]^2\ C$ and $J(t) = 0.5\ [I(t)]^2\ L$.