Full energy of spring-mass system is W=Wp+Wk;

$Wp = \frac{kx^2}{2}$ – Potential energy

$Wk = \frac{mV^2}{2}$ - kinetic energy

x – displacement of mass;

K – constant factor characteristic of the spring, its stiffness.

m – mass;

V – velocity of mass;

If equation of oscillation is $x = Acos(wt \pm \varphi)\ or\ x = Asin(wt \pm \varphi)$, we have

$$Wp = \frac{k(\left(Acos(wt \pm \varphi)\right)^2}{2} = \frac{k}{2}A^2cos^2(wt \pm \varphi)$$

$V = x'(t)$ - derivative from x(t)

$$x'(t) = \left(Asin(wt \pm \varphi)\right)' = A \cdot w \cdot \cos(wt \pm \varphi)$$

$$Wk = \frac{mV^2}{2} = \frac{m}{2} \cdot A^2 \cdot w^2 \cdot sin^2(wt \pm \varphi)$$

$$W = \frac{m}{2} \cdot A^2 \cdot w^2 \cdot sin^2(wt \pm \varphi) + \frac{k}{2}A^2cos^2(wt \pm \varphi)$$

Where $w = \sqrt{k/m}$