

**QUESTIONS**

One Energy uses cranes to build wind turbines. Some of these cranes utilize springs on their long arm, or their boom, to help them lift loads. We can analyze this system using Hooke's Law. Hooke's Law includes the variables  $F$  for force (measured in Newtons),  $k$  for the spring constant (measured in Newtons per meter), and  $x$  for the change of spring length (measured in meters).  $X$  is the distance between a spring's resting length and its new stretched length. Hooke's Law has a negative symbol in it because the spring will want to bounce back, no matter which way it is stretched!

$$\text{Hooke's Law: } F = -k * x$$

$$\text{General Force Equation: } F = m * a$$



The spring shown here is on the boom of a crane. The spring can noticeably stretch if enough force is applied to it.

**Level 1:** If the spring constant of a system is 400,000 N/m and the change of spring length is 30 cm (0.3 m), what is the force from the spring? If you increase the spring constant value, will the force increase or decrease?

**Level 2:** In the system below, a spring with spring constant of 100,000 N/m is compressed 0.5 cm (0.005 meters) between a wall and a 20 kg block. First, find the force that the spring exerts on the block using Hooke's Law. Second, find the acceleration of the block due to the spring force.

