Strain Gauge Example

Strain Gauge Example:

A strain gauge with a gauge factor K of 1.666 is placed on a compressor tank. The gauge has an initial resistance of 120Ω and it is connected to the given Wheatstone Bridge circuit. And output of Wheatstone Bridge circuit is connected to an instrumentation amplifier with a positive gain of 61. When the tank is empty the amplifier is balanced and the output is 0 volt.

a) When the tank is filled with almost full with gas the output voltage of instrumentation amplifier is 4V. Calculate the amount of stretching (strain) of strain gauge.

b) Calculate the output voltage of instrumentation amplifier when the gauge is stretch of 2.5%.

Dr. Mehmet Yüksekkaya

Strain Gauge Example

a)

Since the output is 0 at balance Va should be equal to Vb so:

$$R_1 = R_2 = R_3 = R_G = R = 120\Omega$$

When the tank is filled the resistance of the strain gauge should different so;

$$R_1 = R_2 = R_3 = R$$

$$R_G = R + \Delta R$$

$$V_a = V_{in}\left(\frac{R + \Delta R}{2R + \Delta R}\right)$$

$$V_b = V_{in}\left(\frac{R}{2R}\right)$$