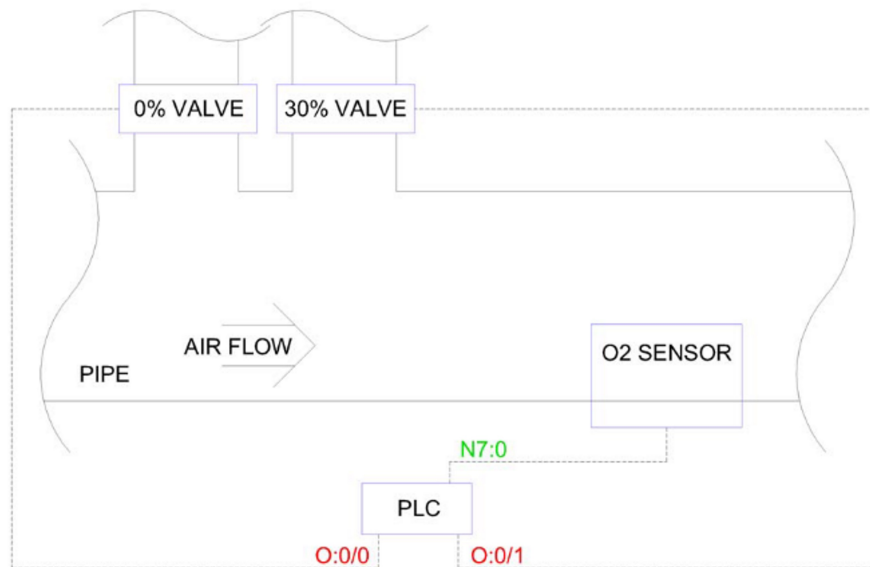# Project 7 Sensor Calibration

Sunday, 2 August 2020   5:09 PM

This system measures the concentration of oxygen in the air at the bottom of a coal mine. As the O2 sensor degrades over time, we will need to calibrate it by comparing its readings to known values.

The sensor we're using reads values from 0% to 40%.

We are given two calibration gases to measure:
- Gas that has exactly 0% O2 concentration
- Gas that has 30% O2 concentration

The system will have two modes:
- Sampling – all it does is measure the O2 in the air passing by the sensor
- Calibration – more complicated
    - Sequence 1: Open 0% calibration gas valve for 30 seconds, then close it
    - Sequence 2: Open 30% O2 calibration gas valve for 30 seconds, then close it
    - Sequence 3: Use the average readings over the last 60 seconds and use them to tune itself according to the following:

$$input_{min} = O^2_{zeroAverage}$$

$$input_{max} = \left(\frac{O^2_{maximumConcentration}}{O^2_{CalibrationGasConventration}} * (O^2_{TestGasAverage} - O^2_{ZeroAverage}) \right) + O^2_{zeroAverage}$$

$$O^2_{maximumConcentration} = 40\%6$$

$$O^2_{CalibrationGasConcentration} = 30\%$$

$$O^2_{TestGasAverage} = Average\ reading\ sampled\ during\ sequence\ 2$$

$$O^2_{ZeroAverage} = Average\ reading\ sampled\ during\ sequence\ 1$$