

App Note 130: How CO2 Gas Flow Affects Measurements

Our goal was to measure the relationship between the rate at which air is circulated through a wide-range CO2 sensor and the speed and accuracy of the reading. The tests lead to 3 results:

1. Over short periods of time (<4 minutes) a CO2 sensor is more accurate if air is circulated (fan).
2. Over short periods of time (<4 minutes) a CO2 sensor using an air-pump reacts more quickly, is more accurate, and CO2 levels fall off faster than the same sensor dependent on diffusion or a fan.
3. Over long periods of time (~18 minutes) a CO2 sensor's accuracy is independent of air circulation.

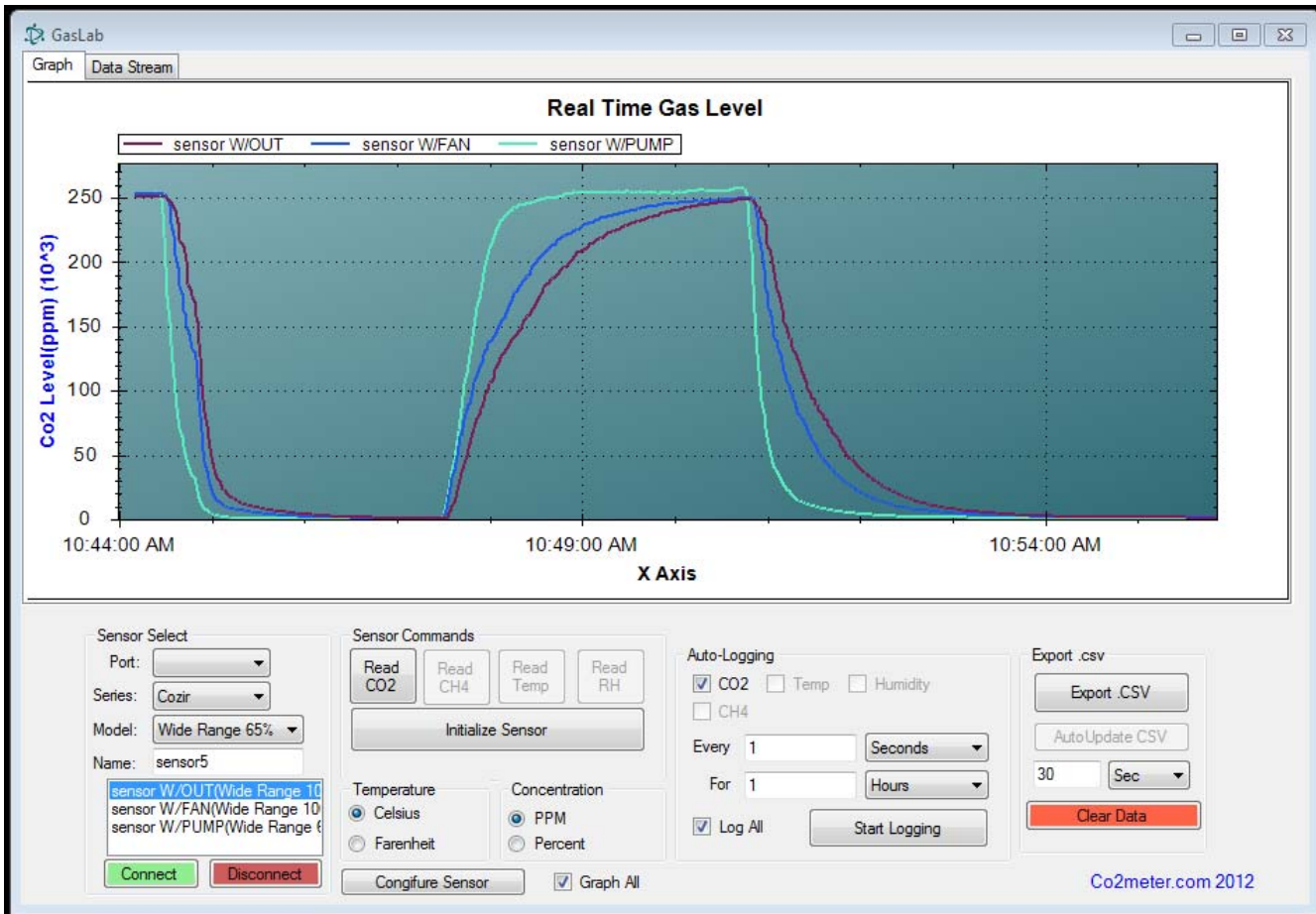
1. Effects of Air Circulation

The graph demonstrates a 100% concentration CO2 sensor exposed to 95% CO2 calibration gas for approximately 3.5 minutes. In both cases, a diffusion sensor was used, but in one, the gas was circulated around the sensor with a small fan. Not only was the response of the sensor faster with circulation, it actually achieves the 95% calibration gas value after ~2.5 minutes.



2. Effects of Different Types of Air Circulation on Sensor Speed

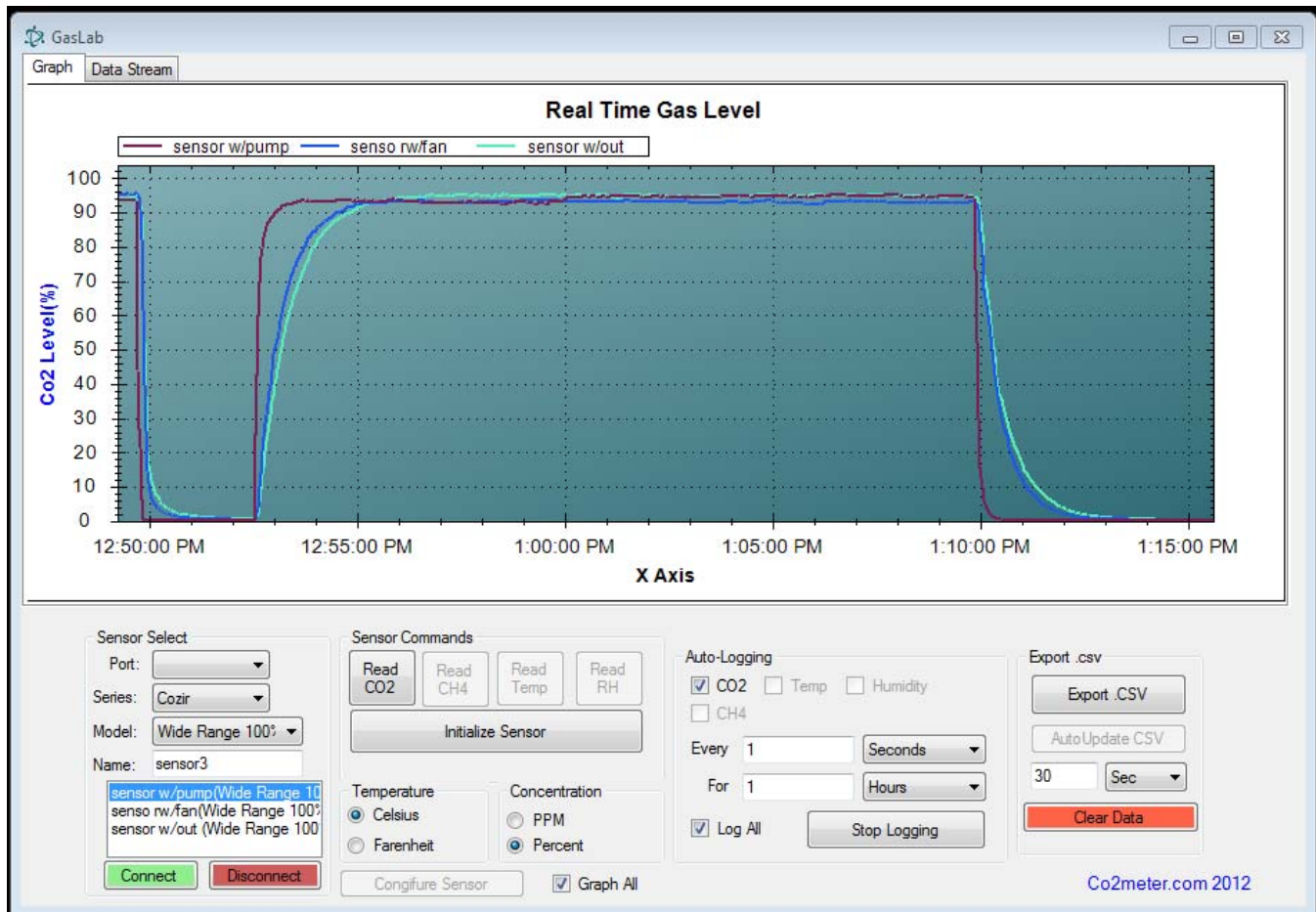
The graph demonstrates a 25% concentration CO2 sensor exposed to 25% CO2 calibration gas for approximately 3.5 minutes. The red line is the response of a diffusion sensor, the blue line is the same sensor with the gas blown across it using a fan, and the cyan line is the same sensor with a 0.2L/min pump attached. Not only is the slope of the graph using the pump higher, it also reaches the full 25% concentration, then has a much quicker fall-off when CO2 is removed from the air sample.



25% CO2 test with pump, fan and diffusion

3. Effects of Different Types of Air Circulation on Sensor Accuracy

The graph demonstrates a 100% concentration CO2 sensor exposed to 95% CO2 calibration gas for approximately 18 minutes. The same sensor was used with air circulated by diffusion, a fan, and a micro-pump. Although the 3 methods for circulating the air provide 3 different rates of achieving the 95% readings, they all maintained the reading within the tolerance of accuracy for the duration of the test.



95% CO2 test with pump, fan and diffusion