Application Note AN-103

May 2016

SPEC Sensors™ Power-On Stabilization Considerations

Scope

For accurate and repeatable measurements, Baseline/Zero current should be stable with no drift. This application note describes the phenomena.

Baseline/Zero Current Stabilization

The electrochemical sensor can be thought of as a capacitor. The bias placed across the working and reference electrodes is similar to voltage across the plates of a capacitor. In the case of the electrochemical sensor, the effective surface area of the "plates" is extremely high. Thus, when the sensor is initially placed on bias, a "charging current" is observed (see **Figure 1**). This current may be as high as several hundred µA initially, but will quickly drop to the low microampere range. Ideally, this baseline current should be in the sub-microamp range. As the sensor continues to be powered on, the baseline/zero current asymptotically becomes lower and more stable, i.e. it improves in performance.

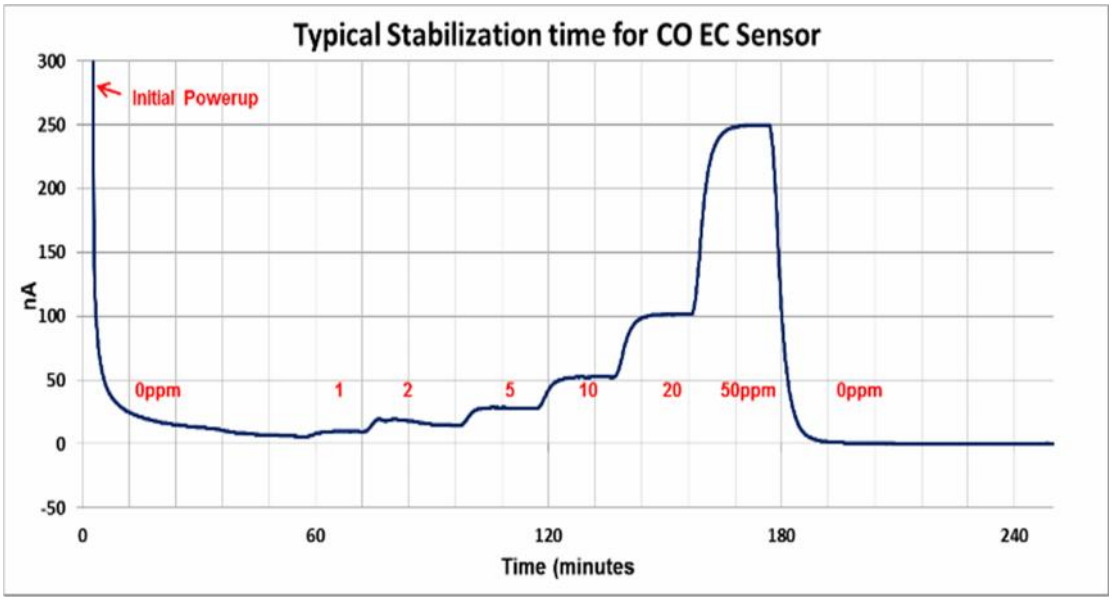

Figure 1: Power on Stabilization of CO Sensor

Thus ***Power-On Stabilization time is dependent on the accuracy goal of the application***. In general, you will observe less baseline drift, and thus improved accuracy, with increasing time after initial power-on increases. The minimum time on power before operation must be determined by the application, based upon the operating bias, minimum detection limit and concentration range of interest. *[See **Figure 2**] This is an example of incomplete warm-up, with potential 100-200 ppb errors in measured levels of NO2 after 20 minute. Note the 160 minute zero/baseline level.*

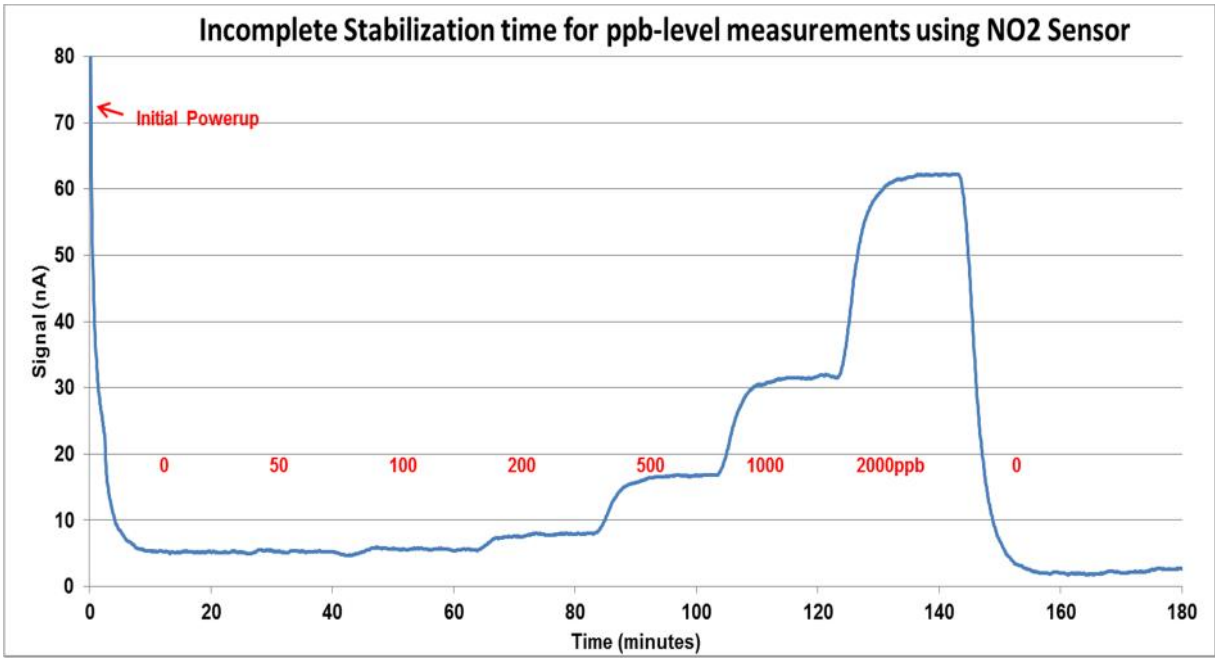

Figure 2. Incomplete Power on Stabilization of NO2 Sensor

In instrument design, the bias should be always "on" because it requires so little power and allows the sensor to be in an "always-ready" status. *In order to provide rapid stabilization of the sensor, sensors which operate at a bias of 0mV may, upon request, be shipped with a shorting clip between the Working and Reference Electrodes. This clip should be left in place until the sensor is installed in the instrument.]*

The baseline current is affected by temperature; this effect can be readily compensated, as described in the ***SPEC Application Note AN-104***. Rapid RH changes may cause transient spikes in the BL, but short term operation at high or low RH has little effect on baseline. This is also discussed in more detail in ***AN-104.***