AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
UniTec SENS-IT CO

Pollutant: CO

Measurement Range:
0 - 80 ppm

Type: Metal Oxide

Time Resolution: 1-min

Additional Information

Field evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/field

Lab evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/laboratory

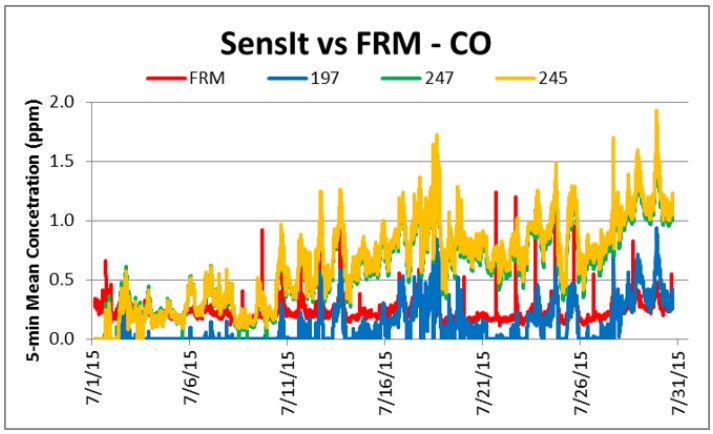
AQ-SPEC website:
http://www.aqmd.gov/aq-spec

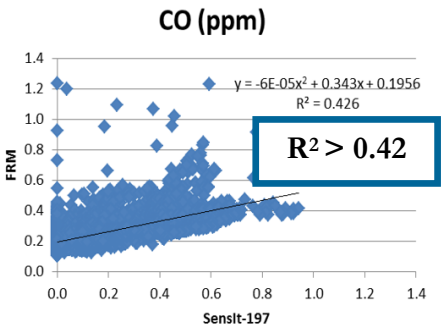
Evaluation Summary

- High intra-model variability was observed among the three Sens-IT units at different CO concentrations.
- The three Sens-IT CO units showed low accuracy compared to the FRM CO monitor, for a concentration range between 0 to 23 ppm.
- Units demonstrated good precision in most of the tested environmental conditions (CO conc., T and RH). However, the Sens-IT units were susceptible to weather conditions (e.g. high temperature & RH).
- Data recovery from the three Sens-IT units was 100%.
- Sens-IT CO units showed weak correlations with the FRM CO in the field (R^2: 0.33-0.43) and strong correlations n the lab (R^2 > 0.90).

Field Evaluation Highlights

- Deployment period 07/01/2015– 07/31/2015: the three Sens-IT units had a modest correlation with the FRM instrument.
- Data recovery from the Sens-It units was greater than 99%.





Coefficient of Determination (R^2) quantifies how the three sensors followed the CO concentration change by FRM.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy

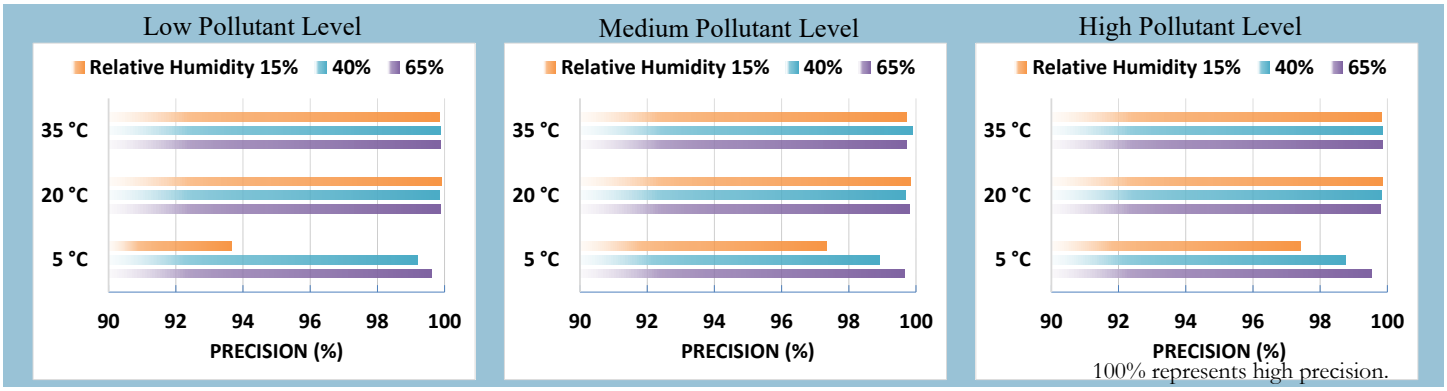
$$A\,(\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

Steady State (#)	Sensor mean (ppm)	FRM (ppm)	Accuracy (%)
1	1.2	2.4	50.0
2	3.8	7.6	50.0
3	5.1	11.4	44.7
4	6.7	16.7	40.1
5	8.4	23.0	36.5

Accuracy was evaluated by a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state are compared to the reference instrument.

Negative % means sensors' overestimation by more than two fold. The higher the positive value (close to 100%), the higher the sensor's accuracy.

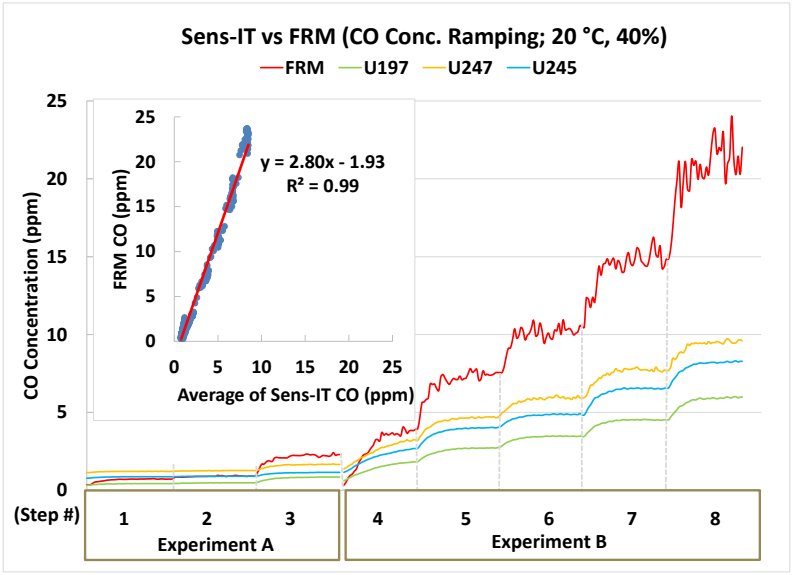
Precision



100% represents high precision.

Sensor's ability of generating precise measurements of CO concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), cold and dry (5 °C and 15%), and hot and dry (35 °C and 15%).

Coefficient of Determination



The Sens-IT units showed very strong correlations with the corresponding FRM data (R^2 = 0.99) at 20 °C and 40% RH.

Climate Susceptibility (linear correlation R^2)

R^2	5 °C	20 °C	35 °C
15%	0.90	0.97	0.98
40%	0.97	0.99	0.99
65%	0.97	0.98	0.99

From the laboratory studies, low temperature and low humidity had a negative effect on the SensIT CO's linear correlation with FRM instrument.

Observed Interferents

Low and high temperature and humidity.